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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Present Condition of Agricultural Meteorology in Brazil

by

HENRIQUE MOREZ

Director of Meteorology and Astronomy at the Ministry of Agriculture of Brazil.

Before the formation of the Ministry of Agriculture, the Brazilian Government possessed no meteorological organization. The State of S. Paulo had, however, already arranged for its own purposes a service which was in regular working. One of the first concerns of the first Minister of Agriculture was to reform the old observatory and to arrange for it to organize a meteorological service capable of meeting agricultural needs. The new establishment started its work at the beginning of 1910, but the first year's efforts were largely of a preparatory nature, and the proper working began in the following year; its activities are steadily developing, and will continue to do so till a sufficient network of stations covers the three million square miles of the national territory.

The object of this service is twofold: its principal aim is to provide all the data required by agriculture, while the second is to carry out as many scientific determinations of general interest as are compatible with the resources of the service without in any way interfering with the work of direct utility. This is the spirit in which the organization has been conceived and is developing.

Each territory of the State forms an agricultural district and likewise constitutes a meteorological district. In each district which reaches a number of stations corresponding to one per 8000 sq. miles, with a minimum of ten altogether, a Central Station will be founded; this will undertake the direct control of the stations in the district, and will send the required figures to the National Observatory at Rio de Janeiro, which directs the whole. Till this stage is reached, the National Observatory exercises direct control over the stations

State Governments which wish to collaborate with the Federal Government for the development of agricultural meteorology are entitled to a subvention, consisting first in the free furnishing of the instruments required, and later in the payment of half the expenses of upkeep. To have the right to this assistance, the Governments must undertake to have the observations made according to the rules drawn up for the federal stations, and to allow their services to be inspected by the officials of the National Observatory appointed by the Director. So far, only the services of S. Paulo and Rio Grande do Sul have been admittod under these conditions, but Minas Geraes is at present equipping its own, and Bahia proposes to do so.

This liberal disposition of the Federal Government reduces the difficulties encountered by the National Observatory in setting up numerous stations in the interior of so vast a country as Brazil. Till recently the positions of the observation points were chosen more or less by chance on the coast or along means of communication, such as railways and navigable rivers. As a result of this, there is a fairly wide belt along the coast in which there are a sufficient number of stations for the climatic conditions to be considered as known. But the vast interior, in places covered with great forests and elsewhere consisting of wide savannahs, is still very little known; it is particularly in these regions, where communication is difficult and there is little chance of finding capable observers, that new stations are required. In this, the local Governments can be of great assistance owing to their knowledge of places and people, which makes easy for them what would be a very difficult task for anyone sent out from the Rio Observatory and not knowing the country.

The number of stations of all classes, including those belonging to subsidized services, is two hundred. For a knowledge of the climate of all parts, sufficiently exact for agricultural requirements in deciding the possibility of introducing new crops or of extending the old ones, at least twice the number are required. It is probable that as soon as the early difficulties are overcome, persevering efforts will result in this end being reached within a few years.

The stations of the Brazilian service conform strictly to the resolutions adopted by several Meteorological Congresses and combined in the "Codex" published by the International Meteorological Committee.

The central observatories, at present three, are placed in class I; they make hourly observations of all the usual elements, and possess registering instruments of the best types, allowing them to undertake investigations of special subjects, such as the rate of spread of storms, evaporation under various conditions, study of the electric potential of the air, etc., etc.

The stations of class II have all the directly-read instruments for determining the usual elements, as well as registering instruments for pressure, temperature, humidity and rainfall.

The stations of class III have no registering instruments; but they make the same observations as those of class II except for duration of sunshine.

The pluviometric stations have only rain-gauges. The observations are everywhere made at the international hours: 7 a. m., 2 p. m. and 9 p. m., for stations of classes II and III-B. Those of class III record only at 7 a. m. and 9 p. m.

The stations of class III-A, besides the climatological observation at these two hours, make a complete observation at the local time corresponding to Greenwich noon; the stations of class II also do this, and the records are telegraphed to Rio to be used in weather-forecasting.

Though forecasting is a part of the regular function of the service, it has not yet been carried very far, as the stations are too few and too irregularly distributed to allow of a reasonable forecast being drawn up; another reason is that true cyclones are unknown in Brazil: although this is a fortunate circumstance, yet it removes the very feature which is mostly readily forecasted. All the efforts are therefore directed to the climatological side.

As soon as the National Observatory is removed to its new building, it will undertake careful and prolonged observations, such as have been almost impossible under present arrangements, to wit: evaporation from large free surfaces; warming of soils of different kinds, at different depths, and under various types of vegetation; continuous determination of the solar constant (at present only made sporadically); electric conductivity and estimation of the ions in the atmosphere, etc., etc.

As the north-east of Brazil is subject to the scourge of drought, sustained observations are now being carried on as to the amount of rainfall, so as to determine the possibility of introducing dry-farming methods.

Brazil possesses immense regions covered by vegetation, in places forest and in places " campos " or savannah. The verge of the latter has lately been steadily impinging on the territory of the forest. The question as to whether this deforestation makes the climate more arid is still unsettled, but may be determined in a few years by observations in the limiting zones, under the same conditions of latitude and altitude.

The Upper Uruguay is subject to periodical floods and low waters, the difference in level being more than 30 feet. During droughts, the river is not navigable owing to falls and projecting rocks. The country along the banks is rich, and produces abundance of maté and good building timber, for which the only practicable means of exportation is the river. In the dry season the rivermen build long trains of wood and plank boats on sandbanks then exposed, filling the boats with bales of maté. When the flood comes these float off by themselves, and they are guided down the river in lines, reaching Urguuayana in a month or two; if the water is very high they go on as far as Concordia, where the timber and the maté make good prices. The boats are also demolished, the planks sold, and the bolts carried up again on horseback to serve for the next year.

It not infrequently happens that the main lasting flood is preceded by "repiquetes", or little floods, which do not last. If the riverman mistakes them for the main flood, he runs the risk of having his train ground and break up among the rocks when the water falls. On the other hand, waiting too long lor the flood to get well established may mean that the train does not reach a good port before the flood is past, as it does not last very long; in this case, also, the cargo would be lost, especially seeing that the maté ferments and spoils in a short time under such warm and moist conditions. Consequently the rivermen are always on the look-out for the real flood. This depends on the setting in of the rains in the regions of the headwaters, that is Santa Catharina and Paranà. When the date of this is known with certainty, the flood will be able to be foretold several days in advance.

The same phenomenon occurs in the Amazon region, affecting other products; but it is difficult to get any exact knowledge of the period of rains in the district of the sources, as the upper tributaries occupy a large and sparsely populated area.

This sums up the principal agricultural problems occupying the attention of the Meteorological Service; it is to be hoped that persevering efforts will result in the resolution of these and other problems which may arise, to the great benefit of the country, of which agriculture will for ong yet be the principal and most fruitful resource.

The Possibility of Using Crude Phosphates (1) and Limes containing Silica as Manures

by

Prof. Th. Pfeiffer,

Director of the Institute of Agricultural Chemistry and Bacteriology in the University of Breslau.

One of the most important nutrient materials for plants, namely phosphoric acid, occurs in large accumulations in nature only under the form of salts soluble with difficulty, in particular as tri-calcium phosphate. As has long been known, the characteristic mentioned makes these crude phosphates (Rohphosphate) in general unfit for immediate use as manures. It should be remembered, however, that the form of combination of the phosphoric acid is not the only decisive factor in its utilization by plant roots; much more frequently other factors come into play. In this connection the remarkably slight action of many phosphorites in comparison with that of bone meal will be remembered; experiments carried out by Mitscherlich (1) well illustrate this point; comparing 0.4 gm. of $P_2 O_5$ as precipitated tri-calcium phosphate, with an equal amount as crude phosphate, he obtained the following results, expressed as increase (+) or decrease (—) in dry matter in the pot without phosphatic manure:

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(1) Undissolved bone meal may to a certain extent be classed with the crude phosphates, but it differs from them so widely in its origin and action, that it is necessarily excluded from the present article.

Precipitated tri-calcium phosphate . . .	+ 27.8 ± 2.21 gm.
Crude phosphate.	2.6 ± 0.47 gm.

It is not to be wondered at that interested persons are constantly trying, to the detriment of agriculture, to palm off crude phosphates as valuable manures, frequently giving them fine names, and quoting the good results of experiments with similar substances obtained here and there under special conditions.

In giving an outline of the utilization of crude phosphates as manures, I must, after these preliminary remarks, confine myself to some of the more important points in the action of these substances, utilizing for the purpose the most recent literature.

A.

I. Prof. A. N. Engelhardt (2) has had remakably good results on his estate of Batishtchev, in the Government of Smolensk, by the application of finely ground phosphorites of Russian origin. "The Podolian phosphorites form an exception, being frequently quite without action; they resemble the French *crystalline* Beauval phosphorites, which, however finely ground, are hardly assimilable, and require to be made into superphospates ". This restricting statement draws attention to the importance which physical condition has on the possibility of utilization of phosphorites. In the some way Tacke (3) speaks of "weicherdigen Phosphaten " (earthy phosphates), which are much more easily attacked by the soil agents than " felsigen Phosphaten " (stony phosphates). A French phosphate from the chalk, only 30.2 per cent. citrate-soluble, was tried by H. Svoboda (4) on three meadows with sandy loam soil underlain by rubble; it gave remarkably good results, even in places doing better than basic slag. In this case also it seems reasonable to consider that the phosphate has a physical structure specially capable of being broken down.

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(1) *Landw. Jahrbücher*, 1912, p. 412. Prianishnikov reports similar results (*Landw. Vers. Stat.*, 1902, p. 122 *et seq.*): it is further to be mentioned that the same investigator found *precipitated* aluminium phosphate also utilizable by plants, and Guillin (*Journal d'Agriculture pratique*, 1907, I, p. 171) reckons that a similar preparation has given as good results as superphosphate.

(2) *Zeitschrift für das landw. Versuchswesen in Oesterreich*, Vol. 3, 1900, p. 631.

(3) *Hannov. Land- und Forstwirtschaftliche Zeitung*, 1909, p. 414.

(4) *Zeitschrift für das landw. Versuchswesen in Oesterreich*, Vol. 11, 1908 p. 733

Further experiments in the same direction were those of TH. PFEIFFER and E. BLANCKE (1) with pot cultures, using sand; they found that Estramadura phosphates had no action on the growth of oats or lupins, while phosphorites from Kasan and Smolensk (used in another year, but under precisely similar conditions) produced a decided increase. Lastly, may be quoted manuring experiments made by H. G. SÖDERBAUM (2); the increase of yield produced by a Tunisian phosphate was 22.2 per cent. of that produced by superphosphate, while the so-called " Bernard phosphate ", prepared by calcination of Belgian crude phosphates, was absolutely without effect.

II. " In all cases earthy crude phosphates (Algerian, Gafsa, etc.) do better than basic slag on sour peatmoor (Hochmoor) soils and those similar to them. On sour mineral soils rich in humus, reclaimed from heath or long manured with heath turves (Heideplaggenstreu), basic slag may be replaced by the crude phosphates mentioned, provided the amount of free acid in cultivated land (reckoned on the dry matter) is about 0.05 per cent., or in meadow land 0.10 per cent.; but the dressing of phosphoric acid must be one-fifth greater than in the basic slag ". This quotation from the article by BR. TACKE already mentioned, brings out very clearly the second important point, namely the significance of the *soil* in the action of crude phosphates. Comparatively good results were obtained by ARTHUR RINDELL (3) on a well humified moor soil to which loam had been applied; Algerian phosphates gave an increased yield equal to 60 per cent. of that given by basic slag in the case of cereals (reckoning the general average of grain and straw) and 91 per cent. in the case of a seeds-ley, Quite different results were obtained in experiments by W. SCHNEIDEWIND and D. MEYER (4) on a humous loess-loam soil containing about 1 per cent. of lime; here crude phosphates showed no results on oats grown for the first two years, and only began to take effect in the following five years, giving an increased yield of various crops up to 36 per cent. of that of basic slag. Remarkably irregular results are recorded by TH. REMY (5) from manuring with Algerian phosphates: in some cases the effect was considerable, in others almost none; considering that there were no controls. this should be attributed primarily to differences in the soil. But these differences are not confined to soils showing different degrees of acidity, for the researches of K. GEDROIZ (6) show that they occur in soils with completely neutral reaction. He refers it to the unsaturated condition of the soil as regards bases.

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(1) *Landw. Versuchsstationen*, Vol. 77, 1912, p. 217.

(2) *Meddelande N.* 56 *från Centralanstalten för Försöksväsendet på Bruksområdet.* Stockholm, 1912. — Abstraet to *Centralblatt f. Agric. Chemie.* 1912, p. 447

(3) *Finska Mosskultur För.*, 1906-1907, 3, p. 182; *Ibid.*, 1910, p. 101. Abstracts in *Jahresbericht für Agrikultur-Chemie*, 1908, p. 182, and *Centralblatt für Agricultur-Chemie*, 1911, p. 593.

(4) *Landw. Jahrbücher*, Vol. 39, III, 1910 p. 236.

(5) *Landw. Jahrbücher*, Vol. 40, 1911, p. 560.

6) *Russisches Journal f. experim. Landw.*, Vol. 12, 1911, pp. 539 and 816.

In considering the soil, the part played by *bacteria* in bringing crude phosphates into solution should not be forgotten. J. STOKLASA (1) even attributes the most important action to them; but in any case the investigations reported by E. KRÖBER (2), by W. G. SACKETT, A. I. PATTEN and CH. W. BROWN (3), by S. A. SEVERIN (4), and others, leave no doubt that soil organisms of various kinds induce liberation of phosphates by forming acids, and very likely also directly. Here again, as far as comparisons have been made, the earthy phosphates have shown themselves comparatively readily assimilable.

III. D. PRIANISHNIKOV (5), mentioning occasional references in previous literature, was the first to emphasize the fact that different plants show decidely different powers of dissolving phosphorites. He estimates the power of utilizing the phosphoric acid of phosphorites, as compared with that of monocalcium phosphate, at 0 to 10 per cent. for cereals, and 10 per cent. for buckwheat and lupins. In further work (6) he was led to the conclusion that "the differences in the power of solubilization of different plants are of more importance than differences in the properties of the crude phosphates".P. KOSSOVITCH (7) extends this point by stating that according to his investigations not only is the utilization of slightly soluble phosphates very unequal with different plants, but that one and the same plant behaves differently as regards the power of solubilizing phosphoric acid of different origins. Further experiments on this point are those of TH. REMY (*loc. cit.*) and A. BAGULEY (8). Remy got good results with Algerian phosphates on oats, peas and especially blue lupins, but not on rye and spring barley. Baguley was investigating the question (not strictly within the scope of this article) of the effect of ignition on the availability to plants of ferric and calcium phosphates, he found differences between oats on the one hand and peas and swedes on the other.

The explanation of these phenomena—whether the plant roots bring varying amounts of organic acids to bear, besides carbon dioxide, or whether the different degree of development of the root system plays some part—cannot be discussed here (1).

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(1) *Centralblatt für Bakteriologie* II, Vol. 29, 1911, p. 385..

(2) *Journal für Landwirtschaft*, Vol. 57, 1909, p. 5.

(3) *Centralblatt für Bakteriologie* II, Vol. 20, 1908, p. 688.

(4) *Ibid.*, Vol. 32, 1912, p. 498. — In a first series of experiments (*Ibid.*, Vol. 28, 1910, p. 561) different results were obtained.

(5) *Landw. Versuchsstationen*, Vol. 56, 1902, p. 107. — The same author gives information on the influence of the soil on the solubility of crude phosphates, which should be referred to section II.

(6) *Landw. Versuchsstationen*, Vol. 65, 1907, p. 23.

(7) *Russisches Journal für experiment. Landwirtschaft*, Vol. 10, 1909, p. 839.

(8) *Journal of Agricultural Science*, Vol. IV, 1912, Part 3, p. 313. Abstract in *Centralblatt für Agrik.-Chemie*, Vol. 41, 1912, p. 675. (Also No. 638, *B* April 1912. *Ed.*).

IV. The merit of having first discovered the dissolving action of *physiologically acid salts* (2), especially ammonium sulphate, on crude phosphates belongs also to PRIANISHNIKOV (*loc. cit.*). E. KRÖBER (*loc. cit.*) has carried this one step further, by showing that nitric acid is produced during the nitrification of ammonia or indirectly in the nitrification of organic compounds.

Physiologically basic salts should naturally have the opposite effect; in this connection, it has been shown many times for bone meal that the addition of sodium nitrate or calcium carbonate (which directly stops the action of acids) greatly lowers the utilization by plants of the contained phosphoric acid, or even completely prevents it. A demonstration experiment very readily carried out is the following: sand-cultures are treated with bone meal and potassium sulphate, and the nitrogenous manuring is given as 1) ammonium sulphate, 2) ammonium sulphate and calcium carbonate, 3) sodium nitrate. The result is that only the plants with the first nitrogenous manuring show luxuriant growth, while the others show evident lack of phosphates (3).

Considering these four points together, we may conclude that crude phosphates may be useful manures under particular conditions and for special purposes, but that much caution should be exercised in using certain substances of this nature recently placed on the market, at any rate till their value has been ascertained without any possibility of doubt.

B.

There is a general opinion, at any rate as far as one may judge from German literature, that quicklime containing fairly considerable quantities of soluble (hydrated) silicic acid is unsuitable as a manure, the idea being that its application will lead to the formation of hard cement-like lumps in the soil.

H. IMMENDORFF (4) has shown that such fears are quite unfounded; this conclusion has been reached as the result of exhaustive experiments, partly carried out by his pupil MEYER at Bexten and only published

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(1) See also the article by TH. PFEIFFER and E. BLANCK referred to above.

(2) This is the term adopted by AD. MAYER for salts whose base is absorbed by plants more readily than the acid. Conversely we may speak of "physiologically basic salts", such as sodium nitrate.

(3) As sources for the facts given in section IV, the following may be mentioned: C. VON SEELHORST, *Journ. f. Landw.*, Vol. 51, 1903, p. 212; A. RINDELL, *l. c.*; O. BÖTTCHER, *Landw. Vrrsuchsstat.*, Vol. 65, 1907, p. 407; H. G. SÖDERBAUM, *Ibid.*, Vol. 68, 1908, p. 433; J. SEBELIEN (abstract by the author), *Centralblatt f. Agric.-Chemie*, Vol. 38, 1909, p. 801; D. PRIANISHNIKOV, *Landw. Versuchsstat.*, Vol. 75, 1911, p. 357.

(4) *Mittlg d. Deutsch. Landw. Ges.*, 1911, p. 514; *Landw. Versuchsstat.*, Vol. 79-80, 1913, p. 891.

in extenso later. "Limes rich in silica (1) behave exactly like silica-free lime from marble as regards their loosening effect on the soil, provided the soil is given the same amount of active material (CaO + MgO) Caking of the surface or formation of lumps in the soil are impossible with all limes, and even with cement, provided the spreading is properly carried out". Immendorff is even inclined to consider the presence of some hydrated silica in lime as advantageous, as this may increase the amount of zeolitic material (mixtures of gels), and so increase the absorptive power of the soil. At any rate limes containing silica need no longer be excluded for manurial purposes.

Recent Progress in Belgian Horticulture

by

M. Vernieuwe,

Director General of the Horticultural Office of Belgium

The quinquennial international horticultural show, held at Ghent (2) in April and May of the present year, which has been fully described in the press, has once more given a striking demonstration of the importance which horticulture has attained in Belgium.

The buildings in which this exhibition was arranged comprised a showroom covering 17 000 sq. yds. and a hothouse 7000 sq. yds. in area. In the showroom one exhibitor, competing for a prize offered, collected together five hundred species and varieties of plants which had been shown in the various exhibitions at Ghent from 1808 onwards. This is a characteristic detail, showing how horticulture, after ceasing to be a hobby of people favoured by fortune, has taken up all possible new plants to feed the trade during the hundred years that have passed.

The Belgian horticultural industry is specially developed in Flanders, and its capital, Ghent, has retained the monopoly of the export trade in its products. Ghent and its suburbs, with several communes further from it, have more than a thousand horticultural establishments, whose area varies from a few rods to 25 or 30 acres. It has also developed greatly in the last twenty years round Brussels and Bruges, as well as to some extent in other places, particularly Antwerp and Liège.

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(1) Including a Portland cement containing 19.51 per cent. of silica soluble in hydrochloric acid.

(2) The Ghent horticultural shows are organized by the Royal Agricultural and Botanical Society, founded in 1808. The first international show was held in March 1837. Since that time the quinquennial international shows, as well as a large number of local shows and competitions, have been held regularly.

According to the register of horticultural establishments and holdings conforming to the regulations of the Berne Phylloxera Convention, and consequently subject to the inspection required by this international act, Belgium has over 1800 horticultural concerns (1) distributed as follows in the different provinces of the kingdom :

	Total	Percentage
Antwerp	98	5.3
Brabant	139	7.4
West Flanders	173	9.2
East Flanders	1 019	54.5
Hainaut	129	6.5
Liège	79	4.2
Limbourg	112	6.0
Luxemburg	51	2.7
Namur	78	4.2

Thus Ghent and its neighbourhood account for more than half the horticultural establishments in the country.

Germany comes first as a consumer of Belgian horticultural produce ; then follow, in order of importance, France, the United States of America, England, Holland, Russia, Austria-Hungary, Switzerland, the Scandinavian countries, etc.

According to certain estimates, the total value of the exports of horticultural plants from Belgium in 1912 was 14 million francs (£550 000) ; in the same year the exportation from Ghent and its neighbourhood alone was over 10 million francs (nearly £400 000).

We way now consider the various species and varieties of plants which figure in this trade. Their number tends to diminish, firstly because amateurs are disappearing in Belgium and in other countries, and secondly because the demands of trade are incompatible with the profitable growing of a large number of different genera.

To supply their customers, the traders require in particular sturdy plants easy to grow, and this in itself explains why the growers limit themselves to a small number of varieties.

One of the dominant plants in Ghent horticulture is *Azalea indica*, of which the Americans are large buyers. The growers endeavour to get good forcing plants, flowering at Easter or Christmas, two seasons during which flowering plants are in great demand in the United States. *Azalea mollis, A. pontica* and hybrids of these, which were rather neglected lately, are now coming into fashion again.

After azaleas come varieties of *Rhododendron ponticum.* The varieties grown are those which bud well and easily as small plants, or hardy varieties suitable for the continental climate of Europe or for the sometimes excessive climate of North America.

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(1) In this number are included nurseries for fruit and forest trees, and even small holdings on which market-garden crops are grown. On the other hand some true horticultural concerns do not appear.

Palms and laurels are also very largely grown. Laurels are at present undergoing great changes in shape. Among palms, which are produced in great quantities about Ghent, mention must be made of *Kentia Forsteriana, K. Balmoreana* and species of *Cocos* and *Phoenix*. Other genera are almost given up.

Tuberous begonias (as bulbs) are grown in great quantities, indeed sometimes in excess, as in some years the crop no longer pays. Begonia growing is especially practised by small holders or beginners. The growing of araucarias (*A. excelsa* and *A. glauca*) is also of considerable importance.

Among the other most largely grown plants may be mentioned *Aspidistra, Dracaena, Croton, Maranta,* certain Bromeliaceae and Aroideae, *Citrus sinensis* and various Australian plants. Camellias are coming into favour again. Owing to the commercial conditions already referred to, the number of varieties of these plants is constantly diminishing, while the individual plants are constantly being perfected.

In the establishments round Bruges palms and laurels, and orchids for cut flowers, are specially taken up.

About Brussels, the plants are grown specially to provide cut flowers: lilac is the great feature, and is largely flowered in winter. Sometimes there is a glut, with consequent fall of prices. Lilacs are beginning to be forced growing in the ground on privet stocks. Forcing is also used for roses; the best forcing varieties are: Frau Carl Druchski, Mistress John Laing, Caroline Tertout, Lyon, Mme. Abel Chatenay, Prince of Bulgaria. After lilacs and roses come chrysanthemums, produced chiefly from September to January. Then, still of considerable, though secondary, value, come *Calla aethiopica,* wallflower, lilies, (*Lilium candidum, L. longiflorum, L. speciosum*), gladiolus, ixias, etc.,, and lastly any quantity of plants grown in the open.

American carnations are taking more and more hold in Belgium. In the international show the Belgian ones were well able to compete with those from other countries.

Among the plants grown in Belgium, special mention should be made of orchids. They are produced about Brussels and Ghent, at Bruges and elsewere. The demand for them keeps on growing; the Belgian production of these cut flowers is at present the largest in Europe. Besides this, amateurs and professionals are engaged in obtaining new varieties from seed and hybridizing; some of those already obtained surpass all imported varieties in beauty and rich colouring.

The slowness of raising orchids in the Belgian climate and the enormous quantity of plants required by the trade necessitate continual fresh importations from their countries of origin. The big firms communicate with collectors exploring the tropical regions of America, Asia, Africa and some parts of Oceania. Early on, Belgium began to organize botanical exploring expeditions with a view to procuring horticultural plants. The first, in 1835, was entrusted by the Government to Lindon; later, Van Houtte became celebrated in this line. At present the chief work of the collectors is to procure and send off large quantities of the known species, especially those suitable for flower-growing on a large scale.

As can be seen from what has been said, Belgian horticultural production tends to become specialized, and as this specialization goes on, another economic phenomenon appears, at any rate with reference to Ghent: this is that while the majority of the firms raise plants, and only exceptionally deal abroad, frequently even not at all, other firms are almost entirely occupied with the export trade, and do very little raising (1).

A new organization of horticultural instruction, considering commercial necessities, will in the future facilitate the relations with other countries and give great encouragement to this part of the work, which will become more and more dominant.

Owing to the specialization in the plants grown, the arrangement of the establisments and the construction and heating of the houses have undergone great changes, constituting decided economic and technical progress. In the old establishments small houses were numerous. as each had to be used for different plants. For some years, most of the houses put up have been large, even up to an acre in area. These buildings offer great advantages for both labour and heating.

The inevitable rise of wages also obliges the growers to economize labour as much as possible, and to devise means for replacing it by mechanical contrivances, at any rate for heavy work, such as watering.

The construction of the houses has been simplified and improved; the choice of materials is more careful. Small panes of glass are given up, and only larger ones used. But the question of heating is the one that has most largely occupied the growers, and it continues to do so, as in spite of the experience gained it cannot yet be said that there is a general agreement on all points of the problem. Originally hot-air heating was general, and it is still used by vine-growers and the small horticulturists. In larger concerns steam heating is preferred. This preference is based, especially for the super-heated steam system; on the better drawing of the fire, which allows a cheaper fuel to be used.

Steam heating is, however, not advisable in all cases, especially for cold houses where the heating is intermittent and the temperature must not rise above a certain point. There are plants, such as orchids, which require a fairly moist atmosphere; for these hot-pipe heating is preferred.

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(1) There is in Belgium only a single society which undertakes the sale of the produce of its members; this is the *Syndicat horticole, viticole et maraicher*, a very prosperous society, which has an auction at Brussels for the public sale of flowers grown by its members, as well as by others.

These remarks would not be complete without mention of some of the means employed to maintain private enterprise, which has been very energetic in the horticultural line in Belgium, and to safeguard the interests of the horticultural industry.

Belgium is with truth said to be the classical ground of societies of all kinds. There are certainly more than 300 societies occupied in some manner with gardening or horticulture. It was one of these societies, the Royal Agricultural and Botanical Society of Ghent (1), which in 1808, as already stated, organized the first known exhibition of plants of flowers For many years the show organized by the Societies for the Encouragement of Horticulture (Sociétés d'émulation horticole), and more recently the horticultural meetings of Ghent and Brussels, have been a great stimulus to progress, and by spreading the taste for flowers and plants have helped to increase the wealth of the country.

For some time Belgium has had the advantage of horticultural instruction. The foundation of the school at Ghent by Van Houtte in 1849, and almost simultaneously of that at the De Bavay establishment at Vilvorde, marks a considerable advance in the history of Belgian horticulture. At the present time horticultural instruction suitable for labourers is given in all the centres of production.

Belgium possesses a State Botanic Garden, in which horticulturist and amateur can find collections of hothouse and outdoor plants to study.

Since 1880, the defence of the commercial interest has been under the energetic and enlightened guidance of the Belgian Chamber of Horticulture (Chambre syndicale des horticulteurs belges), whose offices are at Ghent.

With the idea of giving to national horticulture an official recognition of its importance, the Government instituted in 1908 a Superior Council of Horticulture, composed of 29 members representing the various branches of the horticultural industry; its mission is to give advice on questions submitted to it by the Governement or by its members.

In the same year, the Government created a service specially designated to study horticultural questions, and in 1911 this service became part of the general administration of the country, with the title of " Horticultural Office ". With the assistance of a corps of employees entitled " State horticultural advisers ", appointed at the end of 1909, the Horticultural Office has already undertaken work of various kinds, from which good results are to be expected.

Lastly, the Government founded as long ago as 1892, in connection with the State Agricultural Institute at Gembloux, a service of research and consultation on the damage caused to crops by plants and insects. This *general* phytopathological service is at the disposition of public administrations and private persons. By Royal Decrees of the 9th of September 1909 and the 8th of November 1912, this was completed by a *special* service, entrusted with the supervision of the measures taken, both in the interior and on the frontiers, to prevent the spread of plants and insects injurious to crops, especially with regard to the horticultural trade relations with other countries.

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(1) The title of « Royal » was bestowed on the society in 1818 by King William of the Netherlands.

Horse Breeding in Japan

by

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The number of horses in Japan in 1910 was as follows:

Original	Cross	Foreign	Total
1 209 334	341 462	13 847	1 564 643

For every hundred inhabitants there are 3.15 horses, which number is very low, when compared with other countries. The foaling number for 1910 is as follows:

Original	Cross	Foreign	Total
47 095	68 976	1 879	117 950

To improve the breed of Japanese horses the Horse Breeding Administration has been established under the control of the Army Minister to which belong three studs for horse breeding, one rearing farm for foals and 15 stallion depots; 6 Inspectors belonging to the Administration are inspecting the horse breeding of the country. The stallions and mares belonging to the Administration numbered 1 372 in 1910, among which there were 565 foreign (Anglo-Norman, Thorough-bred, etc.), 256 cross stallions, and 551 brood mares. The stallions are distributed among 262 covering stations, and they are placed for the public service between April and July. The fee of 5 to 10 Yen (1) must be paid for the service of superior stallions. The percentage of foaling is 50.

To encourage the improvements of horse breeding the Administration gives premiums and prizes at local shows, races, etc., which expenditure amounted in 1908 to about 630 000 Yen. The castration of foals is also encouraged by giving a premium of 4 Yen for one gelding.

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(1) The Yen is equal to about 2 shillings.

For providing the remounts to the Army there are 10 Remount depots, and about 3 500 yearlings are annually purchased; these are kept there for three years, and then distributed among the regiments.

There are also 11 breeding studs belonging to the local governments and about 250 000 Yen are expended for these establishments

I. Characteristics of Native Horses

The breeds of horses native to Japan have but few distinguishing characteristics. Prof. Imoi, however, groups them into four breeds according to form and character; the differences are due to diversity of land-features, climate, food, management, etc. because horses are bred throughout Japan proper, from Kyûshû in the South to Hokkaido in the extreme North. The breeds are as follows:

1) The Hokkaido, found throughout Hokkaido.

2) The Nambu, found in the extreme northern part of the Main Island in the Aomori, Iwate and Akita Prefectures.

3) The Miharu, found mostly in Miyagi, Fukushima and Yamagata Prefectures, south of the above-mentioned region.

4) The Satsuma Breed, found principally in Kagoshima and Miyazaki Prefectures.

1. *The Hokkaido Breed.*— The horses of the Hokkaido breed are small in size. The island is believed to have originally possessed no horse, and it is surmised that the introduction of the horse from the mainland begins the history of the production of this useful animal. Ancient annals, however, tell us that certain Ainu, or aborigines of Hokkaido, made presents of horses as tribute to the authorities of the Main Island as early as 718 A. D., and we may take this as evidence of the existence of the horse at such a remote age. Real progress in horse breeding in Hokkaido begins, however, with the introduction of the Nambu breed into the island towards the end of the 18th Century. Although the Hokkaido breed is the outcome of this introduction, it yet has many peculiarities of its own. The horses of this breed range in height from only 3ft. 8in. up to 4ft. 3in., and they might more appropriately be termed ponies. The small Hokkaido horses are decreasing gradually, being substituted by horses with a considerable infusion of foreign blood.

To describe the native Hokkaido breed in detail, we may say that the typical northern horse has a large heavy head and a long body: the legs are short and clean with well articulated joints and the hoofs are good: the croup is not so narrow and weak as is the case with horses of other breeds found in Japan, which is one of their greatest defects. The horse has likewise well-developed muscles capable of producing quick and easy gait. The horse can easily travel about 25 miles a day carrying a rider weighing about 125 pounds.

The principal horse-producing district in Hokkaido is Hidaka, which is followed by Iburi and Toshima in order of importance. The excellence of the Hokkaido horses as good pacers is due to the vast extent of the land, which renders the use of the animal indispensable for intercourse among the country people.

In recent times, Thoroughbred horses have been introduced to produce valuable race horses; fine specimens of these often attain the height of 5ft. and more.

2. *The Nambu Breed.* — This breed is found typically in Aomori Iwate and Akita; it is the heaviest as well as the strongest horse of the country. This region has long been famous as a horse-producing district, the Persian horse having been introduced some 400 years ago, and other foreign stallions have been brought in more than once. As in other countries, these fine imported breeds have never been admired by the people and they were hardly used for breeding purposes. The total lack of foreign blood in the Nambu horses observable in our days may be ascribed to this fact. At present, however, the introduction of Thoroughbred, Hackney and Anglo-Norman horses is encouraged for the improvement of the native stock.

The Nambu breed is easily distinguished by a large heavy head, a thick low neck and a long slender body. The croup is narrow, short, sloping and not well developed; the legs are short and rather heavy, while the articulation is somewhat weak, the hoofs being large and flat. Owing to the poorly developed muscles, the gait is not very quick or light. The height is from 4ft. 7in. up to 5ft., but fine halfbred horses often measure more than 5ft. 2in. Most of the horses used in the army are of this breed.

3. *The Miharu Breed.* — To this breed belong the horses produced in the greater part of Northern Japan, especially in Miyagi, Fukushima and Yamagata and throughout the country as far as Gifu and Ishikawa in the West. This extensively diffused breed seems to have received Nambu blood in the proximity of Iwate and Akita, as in Miyagi, Yamagata and Fukushima, but the pure Miharu horse has its own clearly-defined characteristics.

The head and neck in the Miharu horse are lighter than in the Nambu breed; the body is somewhat long and small, while the croup is narrow, short and sloping. The legs are not so short as those of the Nambu horse, and rather clean, but the hind legs are always forestanding with consequent poorer articulation of the hock-joints. The hoofs are rather hard and well formed. The horses have good action, since horsemanship has been greatly encouraged from ancient times. The height of the animal is 4ft. 6in. to 4ft. 9in. Horses of this breed are little used in the army compared with the Nambus. In Nagano we find a smaller form of the breed called the Kiso mountain horse, which may be grouped with the Miharu breed.

4. *The Satsuma Breed.* — Satsuma horses are found in the southern provinces of Kyûshû, *viz.* Satsuma, Hyûga and Osumi, where they have been reared from early times. It is stated that under the reign of the Emperor Nara, some five hundred years ago, Arabs were introduced, and

to this fact the superiority of the Satsuma horses may be due. Horsemanship was common in ancient times, and this resulted in the breeding of excellent saddle-horses. In our days, horse racing is in great vogue in this region.

The characteristics of the breed are that both head and neck are well formed; the body and croup is regular, compact and short, while the defect of narrow chest is present. Both fore and hind legs are slender and perfectly clean, while the hoofs leave nothing to be desired. Although the animal has not strongly articulated joints, it has good proportions for a saddle horse. The Satsumas are the best race horses at present, and the average height is 4ft. 8in. Unfortunately the horse is not yet very much used in the army. The breed is widely diffused in Kyûshû, Shikoku, and, in general, in the western part of the Main Island.

II. The Rearing of Horses,

Feeding. — In Japan, horses are fed principally on the wild grasses of the locality, although this practice is somewhat modified in several provinces. In Hokkaido, which is rich in pasture, the animal is set free to graze; in Nambu, Akita, Miyagi and Fukushima, where the land is still comparatively unoccupied, the animal is fed partly in pastures and partly in stables. In the months between November and the May following, the animals are kept in stables, since the ground is covered with snow and no pasture is available. On the contrary, down in Satsuma, where the country is too densely inhabited to leave any ground for pastures, horses are mostly fed under cover by giving them green fodder freshly cut from the neighbouring fields and the ridges between the rice-fields. This is the case also in many other localities.

Hitherto, it has been customary among the farmers who rear horses to let them graze in the pasture in spring and summer and to feed them under cover on coarse hay, beans, millet and sorghum stalks during the winter. Some careful feeders mix a small quantity of bran with the regular diet as a sort of relish. Nowadays, however, most of the horses above medium grade are fed with a small quantity of beans, barley and oats, in addition to hay which was the exclusive diet of former times. Beans are added to the rations of the Nambu horses, oats to that of the Hokkaido ones, while the Kyushu horses get some bran with their other food.

Exercise. — There is no established form of exercise. In Hokkaido, as well as in other districts where there is plenty of land, foals follow their dams when the latter go to neighbouring places with riders and packs on their backs, and this helps greatly to strengthen the young animals. Particularly in Hidaka exercise in the open is possible all the year round, as the snow-fall is little. In Akita and Nambu, where snow lies so many months and there is no place available for exercise in the winter, the poor animals are kept in stables, to the great detriment of their health and strength. Of late, in many provinces valuable horses are exercised in the winter months, though only sparingly. Ordinary mares loaded with fire-wood and charcoal are taken to neighbouring towns and are followed by their foals; but such occasional trips should not be regarded as equivalent to that regular exercise so desirable for the young animals. It may be said that the foals are never sufficiently exercised by the farmers in the north who are engaged in horse raising. Even in districts where there is little or no snowfall, as in Kyûshû, the foals are seldom exercised during the winter months. It is only the valuable animals that are driven or ridden when young in order to give exercise suited to their development.

Breeding. — Covering is generally carried on from April to June, the dams being generally covered by stallions belonging to the State or to private individuals. Now-a-days good stallions are imported from France, England and Hungary, and these foreign races, as well as fine halfbred stallions produced in this country, are placed at the disposal of rearers.

The birth rate comes up to 50 per cent. Mares in foal are generally used for some light sort of field labour; but in the north dams are often fed for the exclusive purpose of breeding, being never worked at all.

III. Different Uses of Horses in Japan.

Hitherto horses have been reared principally for agricultural ends, to do occasional field work and to produce stable manure. In country districts, pack-horses were formerly used for transport, After the Restoration, the demand for army horses on the one hand, and for cart horses on the other, due to the increase of the army and the development of roads, has steadily increased. Since the importance of, and interest in, horse racing are not at all what they are in European countries, the breeding of race-horses has been but little cared for. Only the Koiwai farm, belonging to Baron Iwasaki, is maintained exclusively for the breeding of Throughbreds. Excepting horses bred for army use, we may safely say that the aim is to produce either animals suited for agricultural purposes or pack-horses.

IV. The Importation of Foreign Stallions and Mares for Breeding Purposes.

Up to 40 years ago, the only imported stallions were American Trotters; but Arabs, Throughbreds and Anglo-Arabs were imported in later years. Quite recently, Hungarians, Anglo-Normans, Hackneys and Throughbreds have been imported. The business is conducted by purchasing committees chosen from among Inspectors of the Horse Breeding Administration, who are sent abroad every year; importations of between 80 and 90 stallions and mares at a time have been made during the last seven years.

V. THE SALE OF HORSES.

Before the Restoration, only foals one or two years old were sold at auction, the control being in the hands of the then existing Feudal Government.

Since the establishment of Horse Breeders' Guilds in late years in different localities, sales have come to be managed by these guilds. Quite recently, after the promulgation of a law with regard to holding Fairs for Domestic Animals in 1910, various fairs have come into existence to undertake the sale of horses, such fairs being classified as Permanent, Periodical and Special, and the number is 1 044, inclusive of those held only for the sale of cattle. According to a Government report of December, 1912, fairs exclusively for horses number 372. Some of these are indeed too insignificant to be designated as fairs, but others are of considerable size and importance, these latter being mostly held by the Horse Breeding Guilds.

In northern Japan two-year-olds are, in general, offered for sale at the fairs. We should add, however, that in Hokkaido it is customary to wait until the age of three is attained, and in Kyushu foals of the first year are put on sale, mostly at the so-called Periodical Autumn Fairs. The owners or breeders of young animals take them to the fair, where they are mostly purchased by horse dealers. Horses for army use are also secured by Government Remount Purchasing Committees on these occasions, the remounts so purchased being taken to the remount depot, where they are properly reared for the service.

For the Government Studs, too, purchase is made of young animals at these fairs fit to be used as State stallions and brood mares; these are kept at the State Foal Yard for two years and then delivered to State stallion depots for the improvement of farm horses.

VI. HORSE SHOWS AND EXHIBITIONS.

In many horse-breeding districts, shows are held in each prefecture, and on some occasions combined shows are held for more than one prefecture. In the smallest show in one prefecture the number of exhibits is fifty. The Prefectural Show is held every year or each alternate year for one prefecture; the so-called "Interprefectural Show" is held only once in two years. In general, 3 to 6 year old animals are brought out on the occasion; but in some cases two-year-olds are shown also, fillies as well as colts. The horse shows held during the year 1911 throughout the country numbered twenty-two.

No large exhibition of horses alone is as yet held, but a considerable number of animals are always exhibited at the Industrial Exhibition, which is generally held once every ten years, for the whole country, and at which selected exhibits are sent from the provinces, great interest being taken therein.

The awards bestowed both at horse shows and exhibitions consist of medals, prizes, and diplomas. In the case of a Prefectural Show prizes range from 200 to 300 Yen, 100 to 150 Yen, and 50 to 100 Yen for 1st, 2nd and 3rd class prizes respectively, and in addition a Medal of Honour is given. At an Interprefectural Show, the first prize is 500 Yen, but at exhibitions only medals of honour or diplomas have been awarded. The judges are always appointed from among Inspectors of the Horse Breeding Administration or Directors of State Studs, and they generally number three for an Interprefectural Show. At an exhibition, experts, distinguished men and others are appointed as judges. The distribution of awards is mostly made by the President of the Horse Breeding Administration in the presence of the Prefect, local officials and the prominent men of the locality.

Points. — The judges give their decision by taking into consideration the points of the animal, little attention being paid to its fitness for certain uses, etc. Trials are made only by riding; hitherto no trial has been made of capacity to jump, or to draw loads.

For the judgment of horses according to the use, or according to the races, no standard has yet been established.

The judges generally first examine the animals separately, after which comparison of the exhibits is made, and then the final awards are given.

Carp-Breeding in Rice Fields in Italy

by

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Breeding carp in rice fields is no novelty, as the Japanese have carried it on for a century and a half with excellent results. But it should be remarked that the conditions of the rice fields in Japan are very different from those prevailing in this country, in that they are mostly permanent and under water the whole year, and may thus be considered as practically ponds. But even in Italy carp-breeding in rice fields has been practised: thus, Sig. Gasch carried it on on the property of Mezzolana, near Bologna, and got very good results; but the breeding was eventually given up for special reasons. It should be noted that the Bolognese rice fields are specially suitable for fish-breeding in being on warp land. It was therefore desirable to make trials in rice fields under the more general conditions of most of the Italian ones, and to arrange that the breeder should not have to undertake any special work and in particular that no changes in the usual method of growing rice should be required. It was further desirable to ascertain the relations between breeding the carp and growing the rice, and whether the latter was in any way damaged. The experiments begun in 1909 immediately gave very promising results ; they were continued in the following years on a constantly larger scale, and it may now be said that carpbreeding in rice fields has reached the stage of application in practice.

The merit for this should be given to the Lombardy Agricultural Society; when the experiments had given good results, this body took up the question in an active manner, facilitating the purchase of fry by the rice-growers, undertaking supervision, and carrying out a general propaganda.

The breed of carp adopted for this work is the Galician mirror-carp, characterized by its deep and short body, which gives it a thick-set appearance. It is a selected race which grows rapidly and has a larger proportion of flesh to bone than the ordinary carp. The mirror-carp does well in our rice fields, even if kept for three years ; but in rice fields in which for any reason the water is low (much below 8 in.), or may be so under certain circumstances, it would be better either not to grow the fish beyond two years or to use a flatter and longer type, such as the Bohemian carp.

The process of spawning to obtain fry to turn out in the rice fields is very simple. The spawning pond should not be too big ; an area of about 10 sq. yds. and a depth of 20 in. is sufficient ; the sides should be sloping. The pond is first sown down to grass and then filled with water; bundles of juniper or pine branches are put in for the fish to lay on. When the depth of the water reaches 8 inches the carp may be turned in ; there should be at least two males to each female, and they must have been kept previously in cool water and the sexes separated. Spawning takes place usually between May and July. If the conditions of the pond are favourable, the carp spawn within three or four days, laying numerous eggs which are fixed to the aquatic plants or to the bundles of branches.

It may be reckoned that a female weighing 2 ¼ lbs gives an average of 100 000 eggs, but a heavier carp may give 250 000 or even more. The eggs develop more or less rapidly according to the temperature, but 10 to 12 days may be taken as the usual time for hatching. In this way plenty of fry can be had for the rice fields ; the number turned in should be from 800 to 1600 per acre, according to conditions. Anyone not wishing to undertake the breeding of fry can easily purchase them ; the present price is about 6 lire (4*s* 6*d*) per thousand.

The only special provision required is to fit the inlets and outlets of the field with wire netting, to prevent fish getting in from outside and the fry escaping. This, of course, should be done before the water is let in.

When turned into the rice field the fry weigh about 30 mgm. each (*i. e.* about 1000 to the ounce) ; as the conditions are excellent, as regard both food and temperature, they very soon reach a moderate size; observations so far show that at the rice-harvest, three months after the fry have been turned in, fish weighing 100 to 200 gms. (3 ½ to 7 oz.) can be found.

The presence of the carp in the field in no way hinders the usual cultivation operations of the rice, such as weeding and drying-off. The first can be done without any attention being paid to the fish ; for the second, the fish must be taken out when the water is drawn off, and put into some ditch or temporary basin; afterwards they go back to the field again. When they are taken out again at the harvest they can be put into a pond or tank for the winter. As they are more or less torpid in winter, and require hardly any food, they may be kept in a fairly limited space, and even not fed. A tank of 3 ft. cube will hold about 85 lbs. of fish. The following summer the carp can be turned into the rice field again when the young plants are firmly rooted; about 80 should go to the acre. At harvest-time each fish may weigh 2 lbs. or more. Of course the number will depend on how many were turned in, but the individual weight will be greater if they are fewer. The carp may be put into the rice fields for a third summer, in which case they reach nearly 5 lbs. in weight; but it is generally not advisable to keep them beyond the third year, as firstly they are too big for the comparatively shallow water, and secondly the increase in weight is small compared to the amount of food they take.

It is thus seen that after the second summer fair-sized carp, already marketable, can be obtained, so that anyone wishing to reduce the trouble can purchase young carp in the spring; these weigh 15 to 20 gms. (½ to ¾ oz.), and at harvest-time run to 600 or 700 gms. (1¼ to 1 ½ lbs.). Thus a fair yield could be got in three months. The experiments so far made indicate that an acre of rice field may yield 90 lbs. of carp.

The presence of the carp is not only not harmful, but actually beneficial to the rice crop. In many cases it has been found that the crop in fields containing fish is cleaner, so that the second weeding is not required; in a few cases, also, the fields with fish in them have given a heavier crop of rice than those without. This is not to be wondered at, when it is remembered that carp eat many insects, molluscs and other animals which damage the rice.

The experiments are not yet sufficiently numerous to make this point certain, but there is no doubt that the crop is in no way harmed by the fish.

The flavour of the carp is generally very good, even when they are freshly taken from the rice field; but if they have a muddy taste, this can be readily got rid of by keeping them a few days in perforated barrels in running water. Carp are so unexacting that they can easily be kept till a convenient time for selling them; the demand for them is generally very good.

During the earlier years of the experiments the requests for fry from rice-growers were very few; but now they are comparatively numerous, and come from various parts of Italy besides Lombardy. The growers have seen the good results, and are taking up carp-breeding widely; they are trying hatching for themselves and endeavouring in every way to make this industry practicable and profitable. All the same, much remains to be done.

There are in Italy 367 040 acres of rice fields, of which nearly all could be used for carp breeding; this means that the value of such fish might be hundreds of thousands of pounds; and this could be obtained without in any way interfering with the rice crop, which indeed would be rather benefited. Carp is thus an extra product which can be obtained with very limited expense and trouble on the part of the rice-grower; the fish crop could be used for home consumption or as material for a small industry. Now that the difficulty of getting cheap food is becoming steadily greater in both town and country, it would be very useful to have a supply of good, wholesome fish at a low price. The small renting farmer might have a tank from which he could get fish whenever he wanted it; this would at any rate serve to improve and vary his generally meagre fare; the city markets could have good fish at low prices, to be sold alive so that it would be guaranteed fresh to the purchaser; thus even the poorer classes could easily obtain a wholesome and nutritions food. Besides this, carp could be used, at any rate as a subsidiary means, in the control of malaria; since they feed on the eggs and larvae of mosquitoes, spreading them in the rice fields in malarial zones ought to facilitate the task of combating this pest, which is not yet dealt with.

Last year another fish, the trout-perch, was tried in rice fields; it does not reach the same size as the carp, but its flesb is of much better quality, This shows that various fish may be grown in rice fields, but there is no doubt that carp are the most suitable for this purpose and give the best results (1).

A Study on Milk and Cheeses in Greece, with regard to their Chemical Composition

by

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In the laboratories of agricultural chemistry at the Ministry of National Economy, investigations are being made into the products of stock breeding and agriculture of the country, especially as to their chemical composition, which is of great importance for the improvement of these products, as well as from the economic and administrative point of view (discovery of and prosecution for frauds). The principal task of one of these laboratories is the determination of the chemical composition of milk and cheeses.

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(1) For further particulars on the methods of breeding carp, see: SUPINO, *La carpicultura nelle risaie, cenni biologici e pratici.* Milan, Società Agraria di Lombardia, 1915.

The figures given in this article are taken from observations extending over two years; during this period it has been possible to consider all the different cases and conditions of sale of these products, and all the samples have been taken under our own direct control, or under the control of an experienced and trustworthy person.

I. MILK.

Milk stock and conditions of milk production.

A. *Cows.* — The number of cows kept specially to produce milk for the towns is relatively very small; it amounts to about 3500, of which about 2500 are in the sheds of Athens and its neighbourhood, the remainder being in a few other large centres.

Almost all these cows come from abroad, especially from Switzerland and Russia, a very few come from Holland, and a very few are also bred in the country, but always out of cows obtained from abroad. They are kept always in the sheds and fed intensively, and give 450 to 650 gallons of milk a year.

There are also indigenous cows, but these are never milked; they are small and live almost entirely on the pastures, very rarely getting any additional food. They do some light work, but they are kept almost entirely to breed working oxen for the peasants.

Here and there in the islands of the Archipelago (Naxos, Tinos, Andros) some rather larger cows are found; these are milked, and the milk is used for making butter and cheese. They yield up to 130 gallons a year. These animals, though generally kept at pasture, get some extra food, and are better looked after than the majority of the cattle in other parts of Greece.

B. *Sheep.* — In Greece the only widespread breed of sheep is the "Vlachica", which numbers about four million head. They are small and very hardy animals, living as migratory flocks, in summer on the mountains and in winter on the plains; they never get any extra food and receive practically no shelter against the weather. The ewes rarely drop twins; they milk for five or six months, giving 300 or 400 grams (11 to 14 oz.) a day.

In the islands of Crete, Scopellos, Zante and Chios there are rather larger sheep of a better breed than those living in the rest of Greece; they are known by the names of the islands from which they come: Cretica, Scopellitica, Zakintina, Chiotica. They are generally kept tethered and get extra food in the shed. Most of the ewes drop two lambs, and in the Scopellitica race four is not rare. The milk yield varies according to the treatment; it often reaches 2 to 5 pints, especially in the first three months after lambing,

C. *Goats.* — There are about three million goats in Greece; the indigenous breed, known as the mountain breed from the regions where it belongs, gives little milk; these goats live always in the open and never get any extra food. They drop one or two kids, and yield 400 to 500 grams (14 to 18 oz.) of milk a day for five or six months.

Besides this mountain breed, there are a large number of Maltese goats, which are kept tethered. There are one or two at each house, and with plenty of food and proper attention they give 3 to 5 pints a day. They are rarely kept as herds, and in this case the owners are graziers, who sell the fresh milk; the sheds and pastures are generally round the large towns, and each day the goats are taken into the town and milked in view of the customers. In Greece, in fact, the fresh ewes' and goats' milk sold in the towns comes from the animals kept near by, while the milk of the large flocks and herds on the mountains is only used for making cheese and buttter.

TABLE I.

Fat content of the milk of 285 cows sampled in the various stables in Athens.

Percentage of fat	No. of cows
3.1–3.5	4
3.6–4.0	47
4.1–4.5	113
4.6–5.0	70
5.1–5.5	29
5.6–6.0	15
6.1–6.5	5
6.6–7.0	2

The samples were taken from cows in full milk, without any account being taken of the breed or of the date of calving; all had, however, calved at least a fortnight before. It should be remarked that in the two last groups, with fat over 6 per cent., the cows, though second-calvers, were only giving 4½ to 5 quarts a day.

TABLE II.

Chemical composition of mixtures of cows' milk.

Breed		Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
12 Swiss	Maximum	1.0320	14.08	5.30	3.63	4.95	0.78	88.04
	Average	1.0309	12.72	4.14	3.33	4.48	0.76	87.28
	Minimum	1.0285	11.96	3.55	2.94	4.21	0.73	85.92
25 Swiss	Maximum	1.0320	13.53	5.05	3.63	4.68	0.79	88.05
	Average	1.0305	12.59	4.15	3.21	4.47	0.76	87.41
	Minimum	1.0285	11.95	3.45	2.79	4.14	0.74	86.47
16 Swiss	Maximum	1.0325	14.17	5.15	3.98	4.62	0.81	87.78
	Average	1.0312	12.92	4.32	3.41	4.41	0.78	87.08
	Minimum	1.0295	12.22	3.95	2.67	4.14	0.75	85.83
8 Russian	Maximum	1.0320	13.67	5.18	3.45	4.81	0.79	87.55
	Average	1.0310	12.96	4.41	3.26	4.54	0.76	87.03
	Minimum	1.0290	12.45	4.00	2.83	4.21	0.73	86.33
7 Russian	Maximum	1.0310	13.76	5.35	3.66	4.68	0.81	87.59
	Average	1.0299	13.06	4.70	3.21	4.38	0.76	86.94
	Minimum	1.0270	12.41	3.90	2.85	3.87	0.74	86.24

N. B. — In these different cases analyses were made each week for a year; in some of the stables cows were removed and replaced by others during this time, but the total number remained the same.

TABLE III.

Fat content of cow's milk at different times during milking.

First half litre	1.4 per cent
After the fifth litre	3.1 » »
Last half litre	7.6 » »
Average of the ten litres	4.7 » »

[One litre = 1 3/4 pint; 10 litres = 2 1/5 gallons].

The milk of a cow which had just calved contained 1.8 per cent. of fat; a fortnight later it was up to 4 per cent., and then remained constant except for slight variations due to the lactation period or the season.

TABLE IV.

Chemical composition of milk from a flock of 400 Vlachica ewes.

	Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
Maximum	1.0370	19.32	8.08	6.59	4.56	0.94	82.10
Average.	1.0358	18.45	7.11	6.24	4.19	0.92	81.55
Minimum	1.0332	17.90	6.05	5.82	3.98	0.90	80.68

TABLE V.

Chemical composition of milk from a herd of 300 mountain goats.

	Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
Maximum	1.0320	16.67	7.12	4.49	4.24	0.82	85.97
Average.	1.0305	15.22	6.11	4.20	4.12	0.80	83.77
Minimum	1.0300	14.03	5.22	3.95	3.95	0.79	83.33

The analyses given in Tables IV and V were made weekly for six months.

TABLE VI.

Chemical composition of the milk of Maltese goats.

	Specific gravity	Total solids %	Fat %	Proteins %	Sugar %	Ash %	Water %
Maximum	1.0326	16.59	6.80	4.81	4.54	0.88	88.34
Average	1.0303	13.79	4.91	3.80	4.27	0.81	86.21
Minimum , ...	1.0270	11.66	3.68	2.05	3.83	0.74	83.41

The samples for the analyses shown in Table VI were taken at random from goats brought round the streets for the sale of milk. This explains the great range in the figures, which represent 125 analyses made over a period of two years.

II. MILK FRAUDS.

The chief frauds practised are watering and skimming; the use of various substances to improve the keeping qualities of the milk is little known in Greece.

III. CHEESES.

The cheeses of Greece may be ranged in two great classes: soft and hard. They are made only from ewes' and goats' milk, and are almost entirely consumed in the country. In 1910 the Royal Agricultural Society of Greece organized a cheese show in Athens; most of the provinces took part in this by sending the different types of cheeses made in their districts. We took advantage of the occasion to obtain samples for analysis of nearly all the cheeses.

The results of these analyses, with some others made later, are shown in Table VII.

TABLE VII.

Chemical composition of the principal Greek cheeses.

Type	Name	Water %	Ash %	Fat %	Nitrogenous matter %	Salt %
Soft	Têta	46.206	6.736	26.464	20.594	4.490
»	»	45.475	6.476	27.280	20.769	4.386
»	»	45.289	5.279	30.048	19.384	3.012
»	»	44.180	5.035	32.679	18.106	2.715
»	»	48.121	5.822	27.399	18.658	3.737
»	»	51.751	5.702	24.567	17.980	3.796
»	Touloumotyri	45.835	5.148	29.173	19.844	2.795
»	»	37.107	5.469	31.694	25.730	3.254
Hard	Kephalotyri	26.104	6.223	29.556	38.117	2.776
»	»	26.318	9.869	28.964	34.849	6.913
»	»	32.193	10.185	28.567	29.055	5.963
»	»	30.024	8.327	27.419	34.230	5.035
»	»	25.588	8.018	36.288	30.106	5.393
»	»	25.835	9.308	28.527	36.330	6.709
»	»	27.641	7.154	25.316	39.889	3.888
»	»	20.066	6.085	39.618	34.231	3.407
»	»	38.427	7.601	25.158	28.814	3.959
»	De Kritis	38.745	7.600	20.313	33.342	4.430
»	»	33.341	7.555	28.295	31.809	4.271
»	»	37.517	6.980	23.618	31.885	3.939
»	Agraphon	34.124	6.582	30.992	28.302	3.894
»	»	28.398	6.165	36.561	28.881	3.317
»	»	30.329	6.520	33.403	29.748	3.522
»	»	29.934	9.314	30.202	30.550	6.005
»	Dutch	33.648	7.395	32.193	26.764	4.246
»	Kasseri	34.518	5.527	20.936	39.019	2.462
»	»	35.216	5.776	24.934	34.074	3.043
»	»	34.540	5.605	20.074	39.781	2.701
»	»	28.978	7.799	33.590	29.633	5.202
»	St. George	28.527	4.325	36.509	36.639	0.888
»	Skyros	22.139	6.031	38.161	33.669	3.172
»	Kassavetie	22.428	5.352	37.555	34.665	2.236

The Present State of the Potato-Drying Industry in Germany

by

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The most important of all the hoed crops is the potato. As a human food, a feeding-stuff and a raw material for technical operations (starch manufacture and distilling) it is of the greatest consequence. Germany's potato crop occupies 8.1 million acres, that is over 12 per cent. of the total cultivated area. All the other hoed crops together only amount to 4 per cent. The yearly production of potatoes in Germany has reached 44 ½ milion tons. The consumption is about 40 million tons; of this about 13 million goes for human consumption, 16 million for cattle food, 4 ½ million for industrial purposes and 6 ½ million for seed. The difference between production and consumption is 4 ½ million tons; this forms the loss, which is due partly to natural respiration during storage, and partly to rotting. The 4 ½ million tons of potatoes used in industry are distributed as follows: 2 ½ million for distillation, 1 ½ million for starch-production, and half a million for drying. The annual loss of potatoes is at present equal to the amount used in industry.

With but few exceptions the potato crop has steadily increased, rising from 25 million tons in 1887 to nearly 50 million in 1912. The yield per acre has in the same period risen from 3 tons 6 cwt. to 5 tons 9 cwt., while the yield per head of population has increased from about 10 cwt. to about 14 cwt. A still further increase of the potato yield is to be anticipated for certain from further improvements in cultivation. The consumption of potatoes has not kept pace with the production.

Potato-drying should therefore establish an equilibrium between the two and at the same time reduce the yearly loss. The following statistics show how well suited potato-drying is for these purposes. In 1907, 118 factories dealt with 125 000 tons of potatoes and produced 30 000 tons of the dried material. In 1912 there were 426 factories, which used 550 000 tons and turned out 120 000 tons of dried potatoes. Thus in five years the number of potato-drying factories has increased three and a half times, while the material dealt with has increased four and a half times. The potentiality of the existing factories is, however, much greater; with a complete utilization of their apparatus, they could take 1 ½ million tons of potatoes, making 400 000 tons of dried potatoes. So far the disposal of the produce has presented no difficulty. With a view to maintaining favourable conditions of the market, keeping prices steady and increasing the area of disposal, the Society of German Potato-driers has arranged an economic understanding; this result has been reached by the formation of the Sales-Union of German Potato-driers, to which most of the factories belong.

The technical development of potato-drying has in a short time reached a high degree of perfection. The German machine-industry has worked so persistently at the construction of the driers, that the dried potatoes now turned out by them are of unsurpassable quality. The firms which have done most in this direction are: J. Aders, of Magdeburg; Büttner, of Uerdingen; Förster and Co., of Magdeburg; Imperial, at Meissen (Saxony); Kletsch, of Coswig near Dresden; H Paucksch A. G., at Landsberg a. W.; the "Tätosin" Drying-machine Company, of Berlin; Venuleth and Ellenberger, of Darmstadt; and Wagner, of Cüstrin.

The drying machines used at present are on two different principles: drums and rollers. Both are widespread, but the roller-system tends to preponderate. The two systems differ in the source of the heat and in the form of the product. In the drums, the drying is carried out by gas from coke, lignite or coal, mixed with air, while the roller-apparatus uses steam or superheated oil. The drum-apparatus turns out potato slices, the roller-apparatus flakes. The drum-system is represented among others by the firms Büttner, Imperial and Wagner.

Büttner's apparatus consists of a fluted drum, in which the potato-slices, prepared from washed potatoes by a special machine by the same maker, are slowly turned over. The hot gases from the furnace are drawn into the drum by an aspirator, and come into contact with the slices, from which they draw off the moisture; this escapes from the drum through the "Cyklon", while the dried potato slices pass out at the far end of the cylinder; after passing through a refrigerator they are ready for packing.

The Imperial drying-apparatus consists of a trough in which revolves a cylinder with perforated casing; the outer surface of this casing is provided with pins, which carry the slices from the trough over the drum where they come in contact with the hot gases streaming through it. The gas is led into the drum through a tube. The dried slices are carried to the store by an air current.

Wagner's drum-apparatus (v. Schütz system) is composed of first and second driers. Each drier consists of four enclosed superimposed drums, in which cylindrical stirrers keep in motion the material to be dried. The oven in which the hot gas is prepared is situated between the two driers and communicates with a chamber provided with valves, in which the gas is mixed with air before being led into the drum. Another of Wagner's machines is the simplex drier, which has five fixed superimposed drums. It is suited for small concerns (about 8 cwt. per hour). The cooling of the dried product is performed by a special machine. The transference of the material to both driers and to the cooler is done by elevators.

Besides the machines mentioned, drum driers are built by the following firms; Bernburg Machine-Works, at Bernburg; Jalm, of Arnswalde; Petry and Hecking, of Dortmund; Sauerbrey, of Stassfurt; and Soest and Co., of Düsseldorf. The improvements in construction refer chiefly to special methods of conducting the hot air to and from the apparatus; in this way the consumption of coke has been reduced from 16 or 18 lbs. to 10 lbs. per 100 lbs. of potatoes.

The roller machines have undergone an essential modification. The first of these consisted of two hollow revolving cylinders, placed close together, and heated by steam at a pressure of three or four atmospheres. The washed and steamed potatoes were brought into the rollers by a distributor; they were then crushed between the rollers, forming sheets of paste of the thickness of paper; these were then scraped off, after making three-quarters of a revolution, by knife-blades against the rollers. The steam was drawn off by aspirators close to the rollers.

Nowadays the rollers are no longer put close together, nor are the aspirators near the rollers; but the speed of the rollers and the steam pressure are increased. With appropriate arrangement of the carrying and crushing cylinders, and increase of the steam pressure from 3 or 4 to 5 or 6 atmospheres and of the number of revolutions from 3 or 4 to 6 per minute, a greater capacity of production has been obtained. At present every square foot of surface of the rollers allows of the drying of 14 to 16 lbs. of potatoes instead of 10 to 12 lbs. The roller-machines built by Paucksch are, in the modern construction, provided with crushing rollers, allowing the drying rollers to be further apart. In this way also the heavy pressure of the rollers against one another is avoided, so that the wear is reduced. By the use of the crushing rollers, the thickness of the layer of potato on the drying rollers can also be increased, so that the production is greater and there is no likelihood of getting an over-dried article. The use of powerful ventilators, rendering a chimney unnecessary, allows all the machines to work separately, as they are arranged so as to absorb the steam from above and below the rollers.

The apparatus built by Förster and Co. is noteworthy for having its two rollers very far apart (10 inches). By this arrangement damage to the rollers by stones or other hard substances is almost impossible, and the wear on the rollers and knives is very slight. The potato-mass is brought into the drying-rollers by guiding-rollers.

The roller-apparatus of J. Aders differs from most others in the arrangement for bringing the material into the rollers. Here the potato-mass is placed below the rollers, whereas in all the others (except Förster's machine) it is placed above; in consequence, the rollers of these two machines turn in the opposite direction from those of the others, namely outwards instead of inwards.

With the exception of Kletsch's apparatus, all the roller-driers use steam. Kletsch's rollers are heated by mineral oil at 230-240° C.: the oil is heated to about 240° in a special oven, and led through the cylinders and back to the oven by pumps; the loss of temperature of the oil during the whole circuit is only about 3° C. The same oil is used again and again, and the loss in a season's working is reckoned at only 10 per cent. The oil requirement of each machine is about 10 cwt. In spite of the high temperature, no burning of the dried material takes place, as the rollers make 6 or 7 revolutions per minute. The use of hot oil for heating the rollers allows the apparatus to be run by electricity, thus avoiding all use of steam and boilers except just for steaming the potatoes. The oil is heated by hot gases from the combustion of coke, which pass round a boiler containing the oil. To utilize the escaping hot gas, an Imperial machine is combined with the Kletsch roller-machine in such a way that the gases pass into the Imperial slicing machine, where they are used to draw off the moisture from the potato-slices.

The improvement of the roller-apparatus, the use of hot-water pumps to return the water condensing in the rollers to the boiler, the improved absorption of the steam from the potatoes, etc., have resulted in a diminution of the steam used taking place at the same time as the increase in the working-power of the machines. Whereas formerly 100 to 120 lbs. of steam were required per 100 lbs. of potatoes, the present requirement is only 60 to 80 lbs. The total costs of desiccation have therefore diminished, though they must still be considered high. The reasons for this are: higher wages of labour. higher prices of coal, and the cost of the now unavoidable storage of the dried potatoes. The total cost varies between 3³/₄*d* and 5 ½*d* per 100 lbs. of raw potatoes.

Hand in hand with the improvement of the apparatus has gone an improvement in the quality of the dried potatoes. While formely the dried ware was turned out not always free from objection (too damp, burnt, etc.), the present products are of remarkably good character. These are therefore used not only as stock feed, but as human food and raw material for industries; their chief use is, however, for cattle, and in this way they are of great importance. Numerous feeding experiments have shown both slices and flakes to be sound concentrated foods, relished by all classes of stock. For fattening pigs flakes have been found better than slices.

In distilleries and yeast-factories good results have been obtained from the use of dried potatoes, which seem inclined to replace maize. Both slices and flakes can be used for preparing lactic acid, and their yield is at least equal to that of maize. For making gums, dried potatoes in the form of meal have also been found suitable.

Dried potatoes in the form of meal (called "Kartoffelwalzmehl" or "Flockenmehl") are now much used in the kitchen and by bakers and confectioners. For preparing soups and moulds "Kartoffelwalzenmehl" is very valuable, making them tasty and readily digestible. In bake-houses and confectioneries the "Flockenmehl" can replace 10 or 20 per cent. of wheat flour; the produce tastes well and keeps longer than it otherwise would. The use of "Flockenmehl" facilitates the working without increasing the cost.

In the ten years of its existence potato-drying has made great technical and economic progress, and its importance to the nation is now generally recognized.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

1015 - **An Act to Regulate the Size and Description of Cases used in the Sale and Export of Fruit and for purposes incidental thereto. Queensland.**

This Act may be cited as "The Fruit Cases Act of 1912", and came into force on July 1st 1913. It prohibits the sale in Queensland, and the export thence to any place within the Commonwealth, of any fruit which is not packed in a case of the prescribed size, measurement and capacity. All cases used for fruit-packing must be new, or clean and free from any insect or fungus disease. All cases used for export must be new. No person shall sell fruit in a case in Queensland, or export fruit in a case until such a case has been visibly and durably impressed, printed, or marked at one end on the outside within a space measuring not more than five inches long and two inches wide:

a) with the name and address of the packer of the case; and

b) with the words "Guaranteed by the packer to contain two imperial bushels", or "Guaranteed by packer to contain one imperial bushel" or one-half or one-quarter of a bushel as the size of such case may warrant.

Any person who does not comply with these regulations shall be liable to a penalty not exceeding five pounds for the first offence, and of not less than two pounds, or exceeding fifty pounds, for every subsequent offence.

Any person who:

a) alters the size of, or tampers with, any case bearing the packer's name, address and guarantee; or

b) wilfully defaces, or alters, or tampers with the packer's name, address, or guarantee on any case; or

c) sells fruit in an unclean case, or in a case infected with either insect, or fungus disease;

shall be liable to a penalty not exceeding ten pounds, or to be imprisoned for any period not exceeding six months.

1016 - **Decree and Order relating to Agricultural Instruction under the Departments and Communes in France.** — Décret et Arrêté portant Règlement d'administration publique pour l'exécution de la Loi du 21 août 1912 relative à l'Enseignement Départemental et Communal de l'Agriculture — *Journal Officiel de la République Française*, Year XIV, No. 165, pp. 5279-5281. Paris, June 20, 1913.

The reorganization of the agricultural services and agricultural education, laid down in article 1 of the law of the 21st of August 1912 (1), has been regulated by the Order of the 17th of June 1913 and the Decree of the 12th of June 1913.

The dissemination of the agricultural information possessed by the departmental (2) directing offices of the agricultural services is to be carried out by means of lectures and publications. The lectures are given by the directors of the agricultural service and by the professors of agriculture. A ministerial order, made on the proposition of the departmental director of the agricultural services and after consultation with the agricultural inspection service, fixes each year for each department the conditions under which the dissemination of agricultural information is to be carried out. This order, in particular, fixes the number and programme of the lectures to be given during the course of the year.

The publications may consist of bills containing instructions and advice for agricultural practice, to be signed by the prefect; also of leaflets and notices for distribution in the communes under the direction of the mayors and of the presidents of agricultural associations and syndicates in receipt of grants from the State or the department.

The establishments for public instruction in which the agricultural instruction is part of the functions of the directing offices of the agricultural services are indicated for each department by ministerial order. In establishments for public instruction not under the Ministry of Agriculture, the agricultural instruction is given by the director of the agricultural services, the professor of agriculture assisting in the directing offices, and the other professors of agriculture, under conditions fixed by an order made conjointly by the Minister of Agriculture and the Minister responsible for the establishment in which the agricultural instruction is given.

The director of the agricultural services assists, in the department, in the working of the service of economic and social interests of agriculture, mutuality and rural hygiene. For this purpose, all demands for grants from the funds of the State or department coming from societies, mutual agricultural associations, breeding syndicates, cooperative credit banks and various agricultural bodies are submitted by the perfect to the director, who advises as to the suitability of the case. The programmes of all subventioned agricultural shows must also be approved by him. He must also undertake enquiries for the creation of chairs of agriculture and the areas under their charge, and for starting practical schools, farm-schools, winter agricultural schools, house-keeping schools or other institutions for technical agricultural education. He also makes enquiries with regard to demands for advances of money made under the laws on agricultural mutuality, credit and cooperation. He is an *ex officio* member of the departmental committees for awarding prizes for silkworm rearing, olive growing and industrial crops, as well as of the committees for agricultural and viticultural studies, and of the committees of herdbooks, studbooks and other genealogical books for breeds of live stock. He may undertake the functions of general commissioner of the shows organized by the State. He may be entrusted by the prefect with investigations on questions of rural hygiene, and may be called on to assist commissions concerning agriculture.

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(1) See No. 1594, *B.* Dec. 1912.

(2) In this article "departmental" and "department" refer to the administrative divisions ("départements") of France. (*Ed.*).

The director of the agricultural services takes part in agricultural investigations; he is also given the direction of the experimental and demonstration fields for agriculture and vine-growing.

Each year the director of the agricultural services presents to the prefect a report on all the agricultural services of the department.

The director, head of the agricultural services in his department, is assisted by one or more professors of agriculture, who fill the chairs corresponding to the districts determined (by ministerial order), and by professors for special subjects (dairy industry, horticulture, bee-keeping, silkworm-rearing, etc.).

The holder of the chair of agriculture in the town in which the directing-office of the agricultural services is situated acts as and bears the title of assistant to the director of the agricultural services (1).

The professors of agriculture, under the control of the director of the agricultural services of their department, are entrusted with the spreading of agricultural information: 1) by lectures to farmers; 2) by regular courses in the establishments for public instruction designated by ministerial order.

The professors of agriculture are, in their respective districts, to assist in investigations, agricultural statistics and commissariat supply, organization and oversight of experimental fields and agricultural demonstrations, organization of shows, and the creation and control of various societies, and in general to carry out all missions and work entrusted to them by the director of the agricultural services. They are consulted on questions of agricultural education or the agricultural service concerning their districts.

Lecturers in the practical schools of agriculture may, at the same time, undertake the duties of professor of agriculture in the district in which the school is situated.

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(1) "Adjoint à la direction des services agricoles". (*Ed*).

DEVELOPMEN
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1017 – **The Most Important Products of the German Colonies.** — THIELE in *Archiv der Deutschen Landwirtschaftsrats*, Year 37 (Report of the Transactions of the 41st General Meeting of the German Council of Agriculture from the 11th to the 14th of February 1913), pp. 211-222. Berlin, 1913.

In the year 1911 the German Colonies produced 3 520 000 lbs. of cotton against 2 420 000 lbs. in the preceding year. The 1912 cotton crop is valued at 6 050 000 lbs. Of this quantity by far the greatest portion is supplied by German East Africa, while Togo contributes but little to the exports.

The cultivation of sisal hemp has developed largely in German East Africa, so much so that in 1911 this colony was able to export 11035 tons of sisal worth £220 500.

The breeding of sheep for their wool is constantly increasing in importance in German South-West Africa; the flocks aggregate about 32 000 head and the exports of wool amount to 187 000 lbs.

Kapok also is on the increase in the German colonies. The production of silk, especially in Kiautschau where close on 30 000 mulberry trees have been planted, is likewise increasing.

As for rubber, a number of planters in German East Africa have associated for working up their crude rubber on cooperative lines. In 1911 the German South Sea Islands became rubber producing countries: Samoa exported in that year £637 worth of rubber, and New Guinea upwards of 4 400 lbs. of guttapercha.

The value of the total exports from the German colonies of oils, fats and produce yielding them amounted to about £1 078 000.

The South Sea Islands are actively engaged in the production of copra, of which they exported in 1910 11 000 tons, worth £171 500. The same year German East Africa exported about 5040 tons of copra, worth £98 000. In 1911 the total value of copra exports amounted to £450 800. German West Africa supplies chiefly the fruits of the oil palms and exported in 1911 nearly £400 000 worth of palm oil and kernels.

In 1911 German South-West Africa produced 1 194 000 lbs, of coffee, worth £12 250.

Tobacco is grown in large quantities in Kamerun and in South-West Africa. Maize is produced in all the colonies, but most of it is consumed on the spot. The cacao produced in the German colonies represents one fifth of the total imports of cacao into Germany.

Among the fruits grown in the colonies, bananas and pineapples deserve to be mentioned.

EDUCATI
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1018 – **Agricultural Education and Research in England and Wales** (1) — *Board of Agriculture and Fisheries*, Leaflet No. 197, 16 pp. London June, 1913.

The Board have since 1888 made grants which now amount to £18 500 per annum in aid of the higher agricultural education in England and Wales, and grants amounting to £7000 for agricultural education of a less advanced character in most of the counties. Besides the above, grants are also available from the Development Fund for the further extension of education of this type.

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(1) See No. 452, *B.* May 1913. (*Ed.*).

England and Wales possess 14 agricultural colleges and agricultural departments of Universities or University Colleges, which after a three or four years' course give the degree of *B. Sc.* in agriculture or the diploma of agriculture. These are the agricultural departments of the following: 1) University College of Wales, Aberystwith; 2) University College of North Wales, Bangor; 3) Cambridge University; 4) University of Leeds; 5) Armstrong College, Newcastle-upon-Tyne; 6) University of Oxford; 7) University College, Reading; then the following Agricultural Colleges: 1) Royal Agricultural College, Cirencester; 2) College of Agriculture and Horticulture, Holmes Chapel, Cheshire; 3) Midland Agricultural and Dairy College, Kingston, Derby; 4) Harper-Adams Agricultural College, Newport, Salop; 5) Horticultural College, Swanley, Kent; 6) Agricultural and Horticultural College, Uckfield, Sussex; 7) South-Eastern Agricultural College, Wye, Kent.

All the above institutes have farms attached for practical and research work, and many of them besides the usual course of studies hold special courses of shorter duration.

There are also four special institutions: 1) The British Dairy Institute, Reading; 2) Harris Institute, Preston; 3) National Fruit and Cider Institute, Long Ashton near Bristol; 4) Royal Horticultural Society's School, Wisley, Surrey.

There are further twelve farm and dairy schools and similar institutions founded and provided for by the county councils.

As regards agricultural research a sum of £31 000 per annum is allocated from the Development Fund for the purpose of aiding research into certain definite groups of subjects.

The institutions and the subjects selected are as follows:

Subject	*Name of Institution*
Plant Physiology	Imperial College of Science.
» Breeding	Cambridge University. John Innes Institution.
» Pathology	Royal Botanic Gardens, Kew.
Fruit Growing, including the piatical treatment of plant diseases	Bristol University, in conjunction with the National Fruit and Cider Institute.
Plant Nutrition and Soil Problems	Rothamsted Experimental Station.
Animal Nutrition	Cambridge University. Leeds University.
Animal Pathology	Royal Veterinary College. Board's Veterinary Laboratory, Alperton, Middlesex.
Dairying	University College, Reading.
Agricultural Zoology, with special reference to Economic Entomology	Manchester University.
Agricultural Zoology, with special reference to Helminthology	Birmingham University.
Economics of Agriculture	Oxford University.

A sum of £3000 per annum has also been allotted to provide assistance in respect of special investigations for which provision is not otherwise made.

Another direction in which agricultural education and research is being developed is in the supply of technical advice to farmers and the investigation of local problems. A grant of £12000 has been made for this object.

England and Wales have been divided into eight districts in each of which is situated an Agricultural Department of a University or an Agricultural College, the scientific and technical staffs of which devote themselves to the investigations of difficulties and problems presented especially by small holders.

The Institutions selected up to the present and the areas in which the services of the staffs are available are as follows:

Institution.	*Area.*
Cambridge University	Bedford, Cambridge, Essex, Herts, Hunts, Lincs. (Kesteven), Lincs. (Holland), Norfolk, Northampton, Suffolk.
Bristol University	Gloucester, Hereford, Somerset, Wilts, Worcester.
Reading University College	Berks, Bucks, Dorset, Hants, Middlesex, Oxford.
Bangor University College	Anglesey, Carnarvon, Denbigh, Flint.
Aberystwyth College	Brecknock, Cardigan, Carmarthen, Glamorgan, Merioneth, Monmouth, Montgomery, Pembroke, Radnor.
Newcastle, Armstrong College	Cumberland, Durham, Northumberland, Westmoreland.
Leeds University	Yorkshire.
South-Eastern Agricultural College, Wye.	Kent, Surrey, Sussex.

Special Courses in Forestry are provided at the Universities of Oxford and Cambridge and the University of North Wales, Bangor, as well as at Armstrong College, Newcastle-upon-Tyne, and at the Royal Agricultural College, Cirencester.

Special grants to the amount of £1000 per annum are made by the Board in aid of forestry education provided at the four first-named institutions.

A practical School of Forestry, established in 1904, is maintained by H. M. Office of Woods, etc., in the Forest of Dean.

A sum of £1200 per annum for two years has been allocated from the Development Fund in aid of forestry research at Oxford, Cambridge, Bangor, Cirencester and Armstrong College, and a sum of £1000 per annum for minor forestry experiments.

A grant has been made by the Development Commission of £2500 yearly for three years for the purpose of providing technical advice in forestry. With this object, England and Wales have been divided into five districts and an advisory officer has been attached to a teaching institution in each district.

The Districts are as follows: Northern, Welsh, Central and Southern, Eastern, and South-Western.

1019 - **The Agricultural Colonial Institute at Florence.** — *Istituto agricolo coloniale italiano*, 13 pp. Florence, May 1913.

The Agricultural Colonial Institute at Florence was founded in 1911 with the object of offering intending colonists the possibility of preparing themselves thoroughly for farming in the colonies. The course of instruction, which lasts two years, is divided into two parts. The first, of a preparatory character, lasts from November 3 to June 30, and the second, or complementary course, lasts from October 1 to June 30.

The curriculum is the following:

First year: Colonial agriculture, general botany, natural sciences in their relation to agriculture, applied mathematics (exercises in map-drawing, valuation and book-keeping), geography and meteorology, French.

Second year: Colonial agriculture, plant geography, systems and diseases of colonial plants, colonial agricultural and chemical technology, colonial farming, climatology and commercial geography, colonial laws and history, colonial live stock breeding, colonial hygiene, colonial entomology, English, Spanish or Arabic as desired.

The lectures are completed by numerous practical exercises. After successfully passing the examination at the end of the second year, regular students obtain the diploma of colonial agriculture.

In the autumn of 1912, for the first time, a course of tropical veterinary science was held for veterinary surgeons; similar courses will henceforward be held regularly. This year the course will last from September 15 to October 14. The course of lectures embraces the following subjects: geography, live stock breeding, entomology, tropical veterinary sciene, hygiene, accompanied by practical work in bacteriology, and breeding and clinical practice.

In the current year from September 15 to November 8 a higher course of colonial agriculture will be held for men already possessing a diploma in agriculture. The programme embraces colonial geography, plant geography, colonial agricultural, meteorology, colonial farming and its products, colonial live stock breeding, colonial farming, colonial history, economics and law; precautions against diseases of men and animals in the colonies. Lectures on agriculture and economy in the Argentine. Those students who pass the examination at the end of the course get a special diploma.

1020 - **Agricultural Demonstration Work in the Philippine Islands.** — *The Philippine Agricultural Review*, Vol. VI, No. 6 (Demonstration and Extension Number), pp. 265-302. Manila, June 1913.

A law has been passed by the Philippine Legislature " to establish stations for practical instruction in matters concerning agricultural demonstration and development ".

As 90 per cent. of the farms are of less than 5 hectares (12 ½ acres) in area, and the vast majority of the Filippino farmers do not read either English or Spanish, a special method of procedure, known as cooperative agricultural demonstrations, has been adopted.

1. *Cooperative demonstration plots on the farms.* — In each place the farmers wishing to benefit from the system become cooperators. Inspectors of agriculture visit the farms and take charge of a plot, which is cultivated according to the best methods, though only by means available to the small farmer. The cooperator gets the benefit of the example and of the increased crop obtained by the improved methods. This system, already adopted in other countries, has everywhere given excellent results.

2. *Demonstration stations* — There will be one of these stations per province; they are the headquarters at which the inspectors are trained and to which they return from time to time to keep in touch with the work. They also produce the seed for distribution to the farmers, and will be used for trying new crops; they also carry on demonstrations on a large scale.

For some years the Philippine railway companies, following those of the United States, have been distributing selected seed and other aids to agriculture. The financial results of this are most interesting: thus the maize traffic of Iloilo in three months in 1912 was greater than in the three preceding years together.

The Manila Railroad Company is constructing a special car for agricultural demonstrations. This will take members of the staff of the Bureau of Agriculture from place to place with all the modern material for instruction (lantern projections, improved products, drawings, etc.); leaflets and selected seed will be distributed free.

1021 - **Provisions for the Trial Year of Tuition for Women Teachers of Agricultural Housekeeping.** — *Ministerialblatt der Königlich Preussisches Verwaltung für Landwirtschaft, Domänen und Forsten*, Year 9, No. 6, pp. 157-161. Berlin, June 1913.

The Ministerial Decree of April 26, 1913, contains the provisions concerning the object and the lines of study to be pursued by the women teachers of agricultural housekeeping during the year of probation ordered by the Decree of September 30, 1909, and gives the list of the schools in which the year of probation may be spent.

1022 - **The Work of the Swiss Agricultural Association in the Year 1912.** — *Jahresbericht des Schweizerischen Landwirtschaftlichen Vereins pro* 1912, 70 pp. Brugg, 1913.

AGRICULTURAL INSTITUTIONS

The present annual report of the Swiss Agricultural Association for 1912 gives, after a general review of the economic conditions of the year 1912 and of the work of the Swiss Peasants, Secretariat and of the Peasants' Federation, a table of the branch and trade associations (30 with 60 326 members) and describes the special work of the Association in the meeting of delegates and sittings of the board, by the diffusion of technical publications, and by the giving of lectures by travelling teachers; it further reports upon the work of the several branch associations, of the commission for the promotion of the cultivation of plants and of the commission for promoting the breeding of pigs and goats. It contains also data on the progress of the Swiss agricultural insurance against accidents, and on the intercantonal seed markets.

AGRICULTURAL SHOWS AND CONGRESSES

1023 – Agricultural Shows.

Austria-Hungary.

1913. Sept. 24 - Oct. 5. Graz (Styria). — Agricultural show of the alpine regions.

Autumn. St. Polten (Lower-Austria). — Agricultural and industrial show.

Oct. 11-19 Budapest. — Regional horticultural show.

Belgium.

1913. Dec. 6-8. Jemeppe-sur-Meuse (Liège). — Second International Poultry Show, organized by the "Société Avicole" of Jemeppe. Secretary, M. Jos. Ghysens, rue Hôtel-Communal, Jemeppe-sur-Meuse.

France.

1913. Nov. 8-10. Troyes (Aube). — Show of chrysanthemums, flowers, fruit and vegetables in season, organized by the "Société d'Horticulture, Viticulture et Fruiticulture de l'Aube". Address: M. Lucien Baltet, General Secretary, Troyes.

Nov. 16-20. Paris. — International show of poultry, rabbits, etc., organized by the "Société Nationale d'Aviculture de France". Address to the Office of the Society, 34, rue de Lille, Paris.

Germany.

1913. Oct. 7-12. Berlin. — Twentieth German show of barley and hops.

Italy.

1913. Oct. 9-10. Morbegno (Prov. Sondrio), Warehouse of the "Società caricatori d'alpi". — Cheese show of the Valtellina. An exhibition of cheese-making appliances is annexed. Address to: "Consorzio pro Gelsicultura", Morbegno.

1914. March - November. Genoa. — International maritime exhibition. The 5th section, 2nd group, includes beverages: dessert wines, liqueurs, vermouths, medicinal wines, ciders, musts, non-alcoholic beverages, brandy, vinegars.

April 15-30. Rome. — Special competition of materials for packing citrus fruits, organized by the "Società degli Agricoltori Italiani", by arrangement with the Ministry of Agriculture; annexed to the Second Exhibition of Agricultural Novelties, organized by the same society. Prizes amounting to £ 63, and medals. Address to the offices of the Society, Via XX Settembre 8, Rome.

Spain.

1914. Spring. Barcelona. — Poultry show.

End of 1914 or beginning of 1915. Barcelona. — International Electrotechnical Exhibition, organized by the Catalonian Electrical Engineers' Association.

Switzerland.

1913. Oct. 10-13. Renens. — Poultry show. Address to the general commissioner, M. Paul Mayor, Bussigny, Vaud.

1914. Berne. — National Swiss Exhibition (Industrial and Agricultural).

Tunis.

1914. April 15-22. Tunis. — International Competition of mechanical ploughing apparatus open to machines of all systems. A sum of £ 800 to £ 2000 has been allotted for this competition; after deduction of the costs of organization, cartage and fuel, the remainder will form money prizes for the competitors. Address to: "Direction Générale de l'Agriculture", 78 Boulevard Bab-Benat, Tunis.

Union of South Africa.

1914. Agricultural shows will be held at the following places:

Feb. 10-11. Robertson. — Feb. 10-12. Britstown. — Feb. 12-13. Worcester. — Feb. 17-18. Caledon. — Feb. 18-19. Queen's Town. — Feb. 24-27 Rosebank. — Feb. 25-26. Graaf Reinet. — Feb. 26-28. King William's Town. — March 2-4. Middelburg (Cape). — March 5-6. East London. — March 10-11. Molteno. — March 12-13. Aliwal North.

— March 12-13. Grahamstown. — March 12-13. Humansdorp. — March 17-20. Port Elizabeth. — March 24-27. Kimberley. — March 31-April 3. Bloemfontein. — April 14-17. Johannesburg. — April 15-16. Oudtshoorn.

United Kingdom.

1914. March 24 - April 4. Earl's Court, London. — International exhibition of the petrol industries; a section will be devoted to petrol motors.

June 24 - July 9. London. — International exhibition of rubber, including cotton, fibres and other tropical products.

1024 - **Agricultural Congresses.**

Belgium.

1914. Brussels. — Sixth International Dairy Congress, organized by the International Dairy Federation. Address to: M. L. Gedoelst, general secretary of the Federation, 15 rue Meyerber, Brussels.

France.

1913. Oct. 14-19. Vernon (Eure). — Annual Congress of the "Association française pomologique" specially devoted to fruits used for cider-making.

1914. Reims. — Third National French Cold-storage Congress.

Spain.

1914. Spring. Barcellona. — Poultry Congress.

Switzerland.

1914. June 8-10. Berne. — Sixth International Congress of the Dairy Industry, organized by the Universal Dairy Association. There will be four sections: Hygiene, Chemistry and Bacteriology, Dairy Economics, General Trade. The papers on the subjects of study will be drawn up and printed in German, French, Italian and English. As these papers are to be distributed to members of the Congress before the 1st of May 1914, they should reach the general secretary before the end of 1913.

United Kingdom.

1914. June 24 - July 9. London. — International Congress of Tropical Agriculture. A section will be devoted to palms and their products.

1915. June. London. — Sixth International Congress of Mining and Metallurgy, Applied Mechanics and Practical Geology.

CROPS AND CULTIVATION.

1025 - **Soil Moisture Determinations for Cotton.** - ROBSON, W. (Curator) in *Report on the Botanic Station, Montserrat*, 1911-1912, pp. 5-6. Barbados, 1913.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

A plot of "Sakellarides" cotton, a quarter of an acre in extent, was divided into 4 squares and the diagonal sections weeded weekly and fortnightly, respectively. Three series of soil moisture determinations were made at intervals of one month, and three samples were taken from each section. The determinations were made by subjecting the samples to 4 hours' drying at 100° C. After cooling, the samples were weighed, and a check drying of one hour was given. The cotton was planted on August 11, and the following results were obtained.

August	11,	plot	hoed	weekly	9.52	per cent	moisture
»	»	»	»	fortnightly	10.55	»	»
September	19,	»	»	weekly	10.89	»	»
»	»	»	»	fortnightly	10.46	»	»
October	13,	»	»	weekly	9.10	»	»
»	»	»	»	fortnightly	9.40	»	»

These determinations do not show that there was any gain in soil moisture resulting from weekly as against fortnightly weeding. The soil from the differently treated plots was reaped and weighed separately, and here again no advantage is shown on account of weekly weeding. The plot weeded weekly yielded 97 lbs. of seed-cotton, and that done fortnightly 98 lbs.

1026 - **The Effects of Calcium and Magnesium Carbonates on some Biological Transformations of Nitrogen in Soils.** — KELLEY, W. P. in *University of California, Publications in Agricultural Sciences*, Vol. 1, No. 3, pp. 39-49. Berkeley, December 14, 1912.

The writer carried out some experiments on a light sandy soil, which, after being sieved, was mixed with various quantities of calcium and magnesium carbonate and 5 gms. of dried blood per 100 gms. of soil.

The whole was then placed under optimum moisture conditions, and the amount of ammonia formed after 7 days of incubation was determined. A second series of experiments was carried out with a sandy soil containing a vigorous nitrifying flora, which was mixed with 2 per cent. of dried blood and various quantities of calcium and magnesium carbonate, the nitric nitrogen being determined after 21 days.

The results obtained would indicate that calcium carbonate has a limited stimulating action on ammonification, which is intensified in the case of nitrification. On the contrary, with magnesium carbonate a distinct toxic action was recorded, ammonification being one third less than in the controls, and nitrification being completely inhibited. No antagonism was observed between calcium and magnesium carbonates.

Other observations would indicate that, though these results cannot yet be generalized, before a satisfactory understanding of the lime magnesia question in regard to field crops is presented, it is imperative to have more specific knowledge concerning the effects produced on the various soil organisms, especially those connected with nitrogen transformations.

The writer is continuing his research along these lines.

MANURES
AND
MANURING

1027 - **Mixed Dressings of Calcium Cyanamide and Nitrate of Soda: Results obtained in Sweden.** — BOLIN, P. (Meddelande Nr. 79 från Centralanstalten för försöksväsendet på jordbruksområdet, Jordbruksafdelningen Nr. 21) in *Kungl. Landtbruks Akademiens Handlingar och Tidskrift*, Year 52, No. 4, pp. 276-281. Stockholm, 1913.

The possible advantage of a mixed dressing of calcium cyanamide and calcium nitrate or sodium nitrate and the utility of experiments on the subject has already been discussed (1).

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(1) See No. 491, *B.* March 1912; No. 899, *B.* June 1912. (*Ed.*).

The writer carried out some experiments on oats in various parts of Sweden, comparing dressings of 200 kilog. per hectare (178 lbs. per acre) of sodium nitrate, 220 kilog. (196 lbs. per acre) of calcium cyanamide and a mixture of 110 kilog. of calcium cyanamide and 100 kilog. of sodium nitrate per hectare (98 lbs. + 89 lbs. per acre). All the plots received in addition 200 kg. of 20 per cent. superphosphate and 100 kg. of 37 per cent. potash salts per hectare (178 lbs. + 89 lbs. per acre). The mean results of 12 trials were as follows :

	Yield in lbs. per acre		Surplus yield in lbs. per acre		Surplus yield relative	
	grain	straw	grain	straw	grain	straw
Control (no nitrogen)	2 327	3 272	—	—	—	—
Sodium nitrate, before seeding	2 572	3 828	244	556	100	100
Sodium nitrate, ½ applied as top dressing	2 616	3 884	289	612		
Cyanamide, before seeding .	2 593	3 780	266	508	109	91
Cyanamide + sodium nitrate before seeding	2 637	3 919	310	647	128	118

Out of the 12 results, 7 were superior to the total mean, and 5 were inferior, the partial means being as follows :

	Yield in lbs. per acre		Surplus yield in lbs. per acre		Surplus yield relative	
	grain	straw	grain	straw	grain	straw
Mean of 7 experiments.						
Control	2 035	3 077	—	—	—	—
Sodium nitrate	2 230	3 525	195	448	100	100
Cyanamide	2 417	3 674	382	597	196	133
Cyanamide + nitrate	2 399	3 795	365	718	187	160
Mean of 5 experiments.						
Control	2 735	3 543	—	—	—	—
Sodium nitrate	3 049	4 252	313	709	100	100
Cyanamide	2 839	3 929	103	386	33	33
Cyanamide + nitrate	2 969	4 090	234	547	75	77

Basing himself on these figures and the general conditions of the experiments, the writer is of opinion that though cyanamide alone may have some favourable influence on the crop, it is not as effectual as sodium nitrate alone and that the mixed dressing is still more effectual than either substance used alone.

Finally, the question as to whether the mixed dressing be an economical one depends largely on the prices of the two manures. With nitrogen worth 1.20 krona per kilog. (7.5*d* per lb.) in calcium cyanamide and 1.60 krona per kilog. (10.2*d* per lb.) in sodium nitrate, the mixed dressing used in the above experiments would in several cases have effected a saving.

1028 – **The Absorbing Power of some Silicates of Potassium.** (Mitt. aus dem Agrikultur. chem. Laboratorium der Univ. Jena). — BUSSMANN, E. in *Journal für Landwirtschaft*, Vol. 61, No. II, pp. 97-134 + 6 figs. Berlin, 1913.

A large majority of German investigators (Remy, Hiltner, Popp, Wagner, Tacke, Pfeiffer, Soxhlet, Haselhoff, Neubauer, Mach, Krüger, and others) are agreed that phonolite cannot be considered as an equivalent substitute for the Stassfurt potassic salts. Hiltner alone has drawn attention to the fact that phonolite may exert a favourable action on the absorbing and assimilating power of the soil.

In order to investigate the beneficial influence of the silicates of potassium, the writer carried out some absorption trials with powdered phonolite and with "Kalktrassdünger" (product obtained by treating "trass", alcaline trachitic tufa, with lime under steam pressure) and compared them with those obtained with the three following soils: 1) A loam ("Lehmboden") from Westphalia derived from a sandstone with a clay binding; 2) a clay soil from the district of Jena produced by the disintegration of "Röt" strata (uppermost layer of a mottled Triassic sandstone); 3) a fine alluvium ("Marschboden") containing a high proportion of clay, from the district of Lüneburg. The composition of the five substances employed per 100 parts of perfectly dry substance is given in Table I, and the results of solubility trials in Table II.

The absorption experiments were carried out in 2 series:

a) When the solutions to be absorbed were of a definite concentration (50 gms. of the absorbing material were treated with 200 c. c. of $\frac{N}{10}$ and $\frac{N}{100}$ solutions for varying periods of time).

b) When the concentration of the solutions to be absorbed varied, (50 gms. of the absorbing material were treated with 200 c. c. of $\frac{N}{2}$, $\frac{N}{4}$, $\frac{N}{8}$, $\frac{N}{16}$, $\frac{N}{32}$, $\frac{N}{64}$, $\frac{N}{96}$ solutions for a definite period of time).

The following are the chief conclusions drawn from the results:

I. The absorption of ammonium chloride is considerable in the case of "Kalktrass" and the alluvial clay from Lüneburg, still high in the case of phonolite, poor in the case of the "Röt" clay from Jena, and slight in the case of the Westphalian loam.

II. In weak solutions, potassium is *adsorbed* and in strong solutions it is *absorbed* by all substances, the intensity of absorption being in the

TABLE I.

	Phonolite	« Kalktrass »	Loam from Westphalia	« Röt » clay from Jena	Alluvial clay from Lüneburg
Silica	55.55	56.34	83.79	50.00	76.58
Alumina	19.56	13.61	6.33	16.06	8.37
Ferric oxide	3.13	2.22	5.24	11.23	6.94
Oxide of manganese	trace	trace	trace	0.04	trace
Lime	1.78	14.10	0.86	9.79	2.08
Magnesia	trace	1.03	—	1.04	3.97
Potash	9.41	2.68	1.41	1.16	0.12
Soda	9.23	2.83	1.01	1.12	1.48
Sulphuric acid	0.91	trace	1.25	0.38	0.42
Carbonic acid	trace	7.46	—	9.14	—
Phosphoric acid	0.09	0.08	0.25	—	—
Reaction	weak alkaline	alkaline	neutral	alkaline	alkaline
Water in air-dry substance. .	3.79	9.86	3.52	13.04	12.74

TABLE II.

Solvent	Per 100 parts of dry substance					
	Substance treated	Insoluble residue	Silica	Ppted by ammonia	Potash	Soda
20 % Hydrochloric acid . .	Phonolite	16.85	52.36	19.01	3.04	8.75
	« Kalktrass » . .	20.57	42.67	13.33	2.23	2.62
10 % » » . .	Phonolite	23.52	47.99	18.63	2.09	7.65
	« Kalktrass ». . .	35.13	30.87	13.07	2.09	2.38
2 % » » . .	Phonolite	41.86	36.20	17.02	0.71	4.25
	« Kalktrass ». . .	50.12	18.94	11.02	0.86	2.09
2 % Citric acid	Phonolite	52.54	29.55	16.71	0.09	1.15
	« Kalktrass ». . .	64.97	11.27	9.94	0.29	1.15

following order: phonolite, "Kalktrass", "Röt" clay, alluvial clay, loam.

III. Calcium is only absorbed in appreciable quantities by "Kalktrass", probably by superficial concentration; phonolite *absorbs* calcium from weak solutions and *adsorbs* it from strong solutions, while the soils absorb practically none from weak solutions and very little from really strong solutions, the little being in proportion to their clay content.

IV. Nitric nitrogen is never absorbed.

V. The loam soil, phonolite, and the "Röt" clay fix magnesium chemically, at first in large quantities and later in slight quantities. The alluvial clay does not absorb magnesium at first, then absorbs it in considerable amounts and later in smaller amounts. Both the alluvial clay and "Kalktrass" in concentrated solutions yield up again part of their magnesium.

VI. Phosphoric acid is only held chemically; to the greatest extent by "Kalktrass" and to the least extent by the loam. All three soils come below "Kalktrass" and phonolite in order of absorption power.

VII. In the majority of the absorption experiments where strong solutions were employed, the absorbing power remained below the calculated curve of normal superficial concentration.

VIII. In all the absorption experiments, a certain amount of water is removed physically from the saline solutions, so that the absorption figures are slightly too low.

IX. Finally, from a consideration of the relation existing between the soil mass and the quantity of fertilizing substances applied, phonolite and "Kalktrass", cannot be looked upon as a satisfactory means of increasing the absorbing power of the soil.

In connection with these experiments, the writer carried out some other trials on the possible influence of phonolite and "Kalktrass" on the nitrogen-accumulating power of arable soil. The results were positive and showed that an application of phonolite or "Kalktrass" favours in a definite and appreciable manner the conditions of life required by *Azotobacter* in the soil, thus contributing to the enrichment of the soil in nitrogen. But as the total number of factors which contribute to this effect is still unknown, for the present the application of these two materials cannot be recommended in practice. Nevertheless the writer made the following hypothetical calculation: a dressing of 1 000 lbs. of phonolite per acre would in 9 months increase the nitrogen content in a layer of soil 8 in. deep by 14.4 lbs. per acre, which would be equal to 68 lbs. of sulphate of ammonia or 89 lbs. of nitrate of soda.

1029 - **Present Condition of the Mineral Phosphate Industry at Curaçao (Dutch West Indies).** — PENSO, E. (Belgian Consul at Curaçao) in *Recueil Consulaire*, Vol. 162, No. 6, pp. 411-415. Brussels, 1913.

Beds of mineral phosphates abound in the Dutch West Indies (Curaçao, Buen Ayre, and Aruba), the richest being in Curaçao (85 to

87 per cent of tricalcic phosphate) and in Aruba (77 to 80 per cent. of tricalcic phosphate. (1).

At the present time the Aruba beds are being worked, and the produce is exported by the limited liability company "Aruba Phosphaat Maatschappij" to whom the Dutch Government has granted the exclusive right of working the beds and exporting the mineral. Transport is effected by steam and sailing ships; in 1912, 20 057 tons valued at £ 10 000 were exported to England, Belgium, France, Italy, the Netherlands, and Portugal.

The working of the rich beds in Curaçao was suspended a number of years ago on account of a disagreement between the proprietors and the worker of the beds. The latter undertook all extraction expenses and paid a royalty of £ 1 on every ton exported; the exports were not to exceed 2 000 tons per annum unless the balance were re-established the following year. From 1875 to 1885 large quantities were exported in excess and then, prices having fallen, the worker of the beds ceased exporting altogether on the strength of the above clause and the accumulated excess over the annual 2 000 tons. The proprietors protested, and the beds were put up to auction and were bought by Hope and Co., bankers of Amsterdam, who formed a limited liability company with a capital of £ 500 000 and paid the colonial exchequer £ 10 312 for all rights. It is expected that the beds will again be worked in the second quarter of 1913.

The writer draws attention to the fact that the "Aruba Phosphaat Maatschappij" paid dividends of 700 per cent. previous to the discovery of the Florida beds, but that at present the prices are very low.

1030 - **Distribution of Nicotine in the Leaves of Kentucky Tobacco.** — CICERONE, D. and MAROCCHI, G. in *Bollettino tecnico della Coltivazione dei Tabacchi*, Year XII, No. 3, pp. 119-123. Scafati, May-June, 1913.

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

The work of d'Errara and of De Toni led to the conclusion that the nicotine in tobacco is located in the epidermal tissue. The writers limited their investigations to the leaves and sought to determine which parts contained the largest quantity of nicotine, using a variety of first class Kentucky tobacco for the purpose. The leaves were dried by direct heating and analysed after having undergone slight fermentation for 4 months in small heaps.

In the long axis of the leaf, the median zone is always richest and the basal zone poorest, the apical zone being almost equal to the median zone. The marginal zone is always richer than the central zone. In the rib the nicotine content decreases regularly from apex to base and the rib as a whole contains about two-thirds less than the leaf blade.

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(1) See: *Production et consommation des engrais chimique dans le monde*, pp. 8-13: Rome, 1913. — O. STUTZER. *Die wichtigsten Lagerstätten der "Nicht-Erze"*, Erster Teil, pp. 389-393, 1911. — K. MARTIN. *Geologische Stüdien über Niederländisch-Westindien*, 1888.

Nicotine per 100 *dry matter in various parts of the blade and of the midrib.*

Samples from	Avellino	Monticchio	Caserta	Scafati	Cava Tirreni
Blade:					
Apical zone.	7.45	5.07	7.46	7.67	7.00
Median »	7.71	5.31	7.70	7.94	7.81
Basal »	7.00	3.97	5.72	7.34	5.80
Marginal »	7.49	5.62	7.75	8.30	7.64
Central »	6.52	4.24	6.44	7.00	7.67
Rib:					
Apical zone	2.85	2.16	2.70	3.16	3.22
Median »	2.17	1.17	1.52	2.47	2.65
Basal »	1.74	0.66	1.37	1.47	1.52

1031 - **Some Results obtained in Studying Ripening Bananas with the Respiration Calorimeter.** — LANGWORTHY, C. F. and MILNER, R. D. Nutrition Investigations, Office of Experiment Stations: in *Yearbook of the United States Department of Agriculture,* 1912, pp. 293-308. Washington, 1913.

In order to keep fruits in season for any length of time, it is necessary to be able to retard or accelerate their maturation as the case may be, and to prevent subsequent deterioration phenomena. Successful handling of fruit therefore will largely depend on an exact knowledge of the changes involved in the ripening, after-ripening, and decay of fruit, their causes and the means of controlling them.

The respiration calorimeter (1) offers a new means of studying maturation phenomena in fruit, and the writers record the first results obtained with bananas during the active ripening period. These results show that the ripening changes progress regularly to a maximum, and then decline; that at its greatest intensity the heat produced is equivalent approximately to 1 calorie per hour per kilog. of bananas. The heat liberated is a measure of the activity of one or more of the ripening processes. Analysis has shown that during ripening the banana starch is transformed into cane sugar, and the cane sugar into invert sugar, and that there are important changes in the character of the tannin compounds, and that other changes occur brought about by the production of aroma and flavour bodies, and perhaps in other ways. It has also been found that in addition to the transformation of carbohydrates there is an actual loss of this food constituent during ripening. From the data for oxygen consumption, carbon dioxide production and heat output, it appears that the heat liberated by the ripening bananas is largely due to the destruction of carbohydrate.

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(1) *U. S. Dep. of Agriculture. Yearbook,* 1911, p. 491. (*Ed.*).

Certain experiments now under way will, when completed, permit of conclusions of practical importance being drawn.

1032 – **On the Presence of Connecting Threads in Graft Hybrids.** — HUME, M. in *The New Phytologist*, Vol XII, No. 6, pp. 216-220. London, June 1913.

The writer examined the graft hybrids *Cytisus Adami*, *Solanum tubingense*, and *Solanum kœlreuterianum* in order to determine whether the presence of connecting threads between the tissues of the two component plants could be observed. In the case of *Cytisus Adami* their presence had already been demonstrated by Buder (1), and the writer merely confirmed his observation. In the case of *Solanum tubingense*, connecting threads were observed in the stem between the epidermal cells (derived from *S. lycopersicum*) and the underlying layer of cells (derived from *S. nigrum*). The threads were not situated in pits, though the cell wall was usually thinner in those regions perforated by the threads, and the median node of each thread was very marked and liable to split. No threads were observed in *Solanum kœlreuterianum*, and the writer attributes the failure to faulty material or methods of preparation.

The presence of threads connecting genetically unrelated tissues throws some light on the origin of the threads; they must "arise secondarily, since it is to be supposed that the naked cytoplasm of the two components does not come into contact. At any rate it is clear that the threads cannot have arisen from spindle-fibres, since no nuclei of the two components have ever been sisters."

PLANT BREEDING

1033 – **The Inheritance of certain Quantitative Characters in Tobacco.** — HAYES, H. K. in *Zeitschrift für Induktive Abstammungs -und Vererbungslehre*, Vol. 10, No. 1-2, pp. 115-129. Berlin, June 1913.

The Mendelian interpretation of the inheritance of quantitative characters is considerably complicated by fluctuating variability which is due to external conditions and non-inherited. In order to eliminate this factor as far as possible, the writer grew parents at the same time as the F_1, the F_2, and the F_3 generation and under similar environmental conditions. If the quantitative character under investigation were inherited in the Mendelian manner, the variability of the F_1 generation should not be greater than that of the parents, while in the F_2 generation it should be greatly increased. Certain F_2 forms should breed true in F_3, giving no greater variability than the parent types; other F_2 forms should give decreased va-

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(1) BUDER, J. Studien an *Laburnum Adami*: II. — *Zeitschrift für indukt. Abstammungs- und Vererbungslehre*, V, 1911, p. 209.

	Year grown	No. of leaves of parents	Range of variation	Total no. of plants counted	Av. no. of leaves per plant	Coefficient of variability
403 (Sumatra).	1910	—	24–31	150	28.2±0.08	5.27±0.21
403 — 1.	1911	29	23–31	125	26.5±0.11	6.64±0.28
403 — 1 — 1	1912	29	21–32	151	26.2±0.12	(2)8.28±0.32
401 (Broadleaf)	1910	—	17–22	150	19.2±0.12	5.00±0.19
401 — 1.	1911	20	16–22	108	19.1±0.05	6.54±0.30
401 — 1 — 1	1912	22	17–23	145	19.9±0.07	6.08±0.24
(403×401) (1) F_1. . . .	1910	—	19–26	150	23.6±0.07	5.51±0.21
(403×401) — 1 F_2 . .	1911	25	17–32	2 402	22.8±0.03	9.52±0.11
(403×401) — 3 F_2 . .	»	24	17–35	1 632	22.7±0.03	8.99±0.11
(403×401) — 4 F_2 . .	»	21	17–33	1 958	22.5±0.03	9.51±0 10
(403×401) — 1 — 2 F_3.	1912	25	19–29	131	22.5±0.09	6.44±0.27
(403×401) — 1 — 3 F_3.	»	26	17–29	186	24.1±0.10	8.51±0.30
(403×401) — 1 — 4 F_3.	»	24	18–26	182	22.0±0.08	7.54±0.27
(403×401) — 1 — 6 F_3.	»	23	20–28	194	23.9±0.08	6.61±0.23
(403×401) — 2 — 1 F_3.	»	21	15–25	188	20.4±0.08	8 04±0.24
(403×401) — 1 — 7 F_3.	«	22	17–28	207	21.5±0.10	10.14±0.34
(403×401) — 1 — 10 F_3	»	26	19–27	151	23.5±0.10	7.83±0.30
(403×401) — 1 — 12 F_3	»	25	18–30	209	23.7±0.14	10.51±0.41
(403×401) — 1 — 8 F_3 .	»	28	19–33	82	26.3±0.20	10.38±0.55
(403×401) — 3 — 5 F_3.	»	27	17–28	159	21.7±0.11	9.45±0.36
(403×401) — 3 — 6 F_3.	»	28	16–27	229	22.5±0.09	8.71±0 26
(403×401) — 3 — 8 F_3.	»	25	17–23	85	20.6±0.12	8.25±0 43
(403×401) — 1 — 13 F_3	»	25	16–29	179	22.5±0.09	10.84±0.39

(1) Cross made in 1909. — (2) Rather a high figure for an inbred line and probably due to high manuring and rank growth.

	Year grown	No. of leaves of parents	Range of variation	Total no. of plants counted	Av. no. of leaves per plant	Coefficient of variability
405 (Cuban)	1910	—	16–25	150	19.9±0.08	7.53±0.28
405 — 1	1911	21	18–23	124	20.6±0.07	5.29±0.23
405 — 1 — 1	1912	23	17–25	150	20.9±0.07	6.17±0.24
402 (Havana)	1910	—	17–24	150	19.8±0.07	6.98±0.27
402 — 1	1911	20	16–25	143	20.3±0.10	8.87±0.35
402 — 1 — 1	1912	20	17–22	150	19.4±0.05	4.59±0.18
(402×405) (1) F_1	1910	—	15–25	150	19.8±0.07	6.10±0.24
(402×405) — 1 F_2	1911	—	14–33	192	20.9±0.16	15.84±0.54
(402×405) — 1 — 2 F_3 .	1912	20	13–29	112	19.7±0.18	14.67±0.67
(402×405) — 1 — 3 F_3 . .	»	20	15–22	142	18.4±0.09	8.56±0.34
(402×405) — 1 — 4 F_3 . .	»	28	20–35	148	26.6±0,16	11.20±0.44
(402×405) — 1 — 5 F_3 . .	»	30	22–34	45	28.8±0.28	10.00±0.20
(402×405) — 1 — 6 F_3 . .	»	22	13–29	201	20.1±0.15	16,17±0.56

(1) Cross made in 1909.

riability in F_3 when compared with F_2 generations; and others should show as great variability as the F_2 generation itself.

The subjects of the experiments were two tobacco crosses: Sumatra × Broadleaf and Cuban × Havana: all these varieties were known to be of fixed and uniform type, and the character investigated was the number of leaves per plant from the fourth leaf from the bottom to the leaf below the bald sucker at the top, that is to say the number of leaves usually harvested.

The results from the Sumatra-Broadleaf family are shown on p. 1364. In 1910 the F_1 generation was intermediate between the two parents for leaf numbers, and its variability was about the same. In 1911 the F_2 generation gave a greatly increased variability, and though the three F_1 individuals selected as parents differed in the number of their leaves, all gave similar results, showing the variation of the F_1 generation to be non-inherited. Of the 13 selections sown in the F_3 generation in 1912, two show about the same variability as the parents, four are intermediate in variablity between the parents and F_2, three show about the same variation as the F_2 generation, and four show a slightly larger variability than the F_2 generation. The two types which were as uniform as the parents were both of intermediate value as compared with the parents for leaf number.

With the Cuban × Havana family the same sort of results were obtained (see table, p. 1365).

In the F_3 generation one selection gave a variability only a little higher than the parents, two gave variabilities as great as F_2, and two were intermediate. It should be noted further that the two selections grown from 28 and 30 leaved parents gave mean leaf values of 26.6 and 28.8 respectively. Thus, by crossing two strains having mean values of about 20 leaves per plant, a new type has been produced with a larger number of leaves.

The writer interprets these results by assuming that in the Sumatra × Broadleaf cross each parent is pure for the same basal condition of 20 leaves, and that in addition the Sumatra parent has some inherited properties which result in the production of 26 leaves and which are due to three interchangeable allelomorphie pairs each inherited separately, the heterozygous condition being half the homozygous condition. In the Cuban × Havana cross he supposes the parent forms to be represented by gametic values for each leaf number of 16 *AA BB* and 16 *CC DD*, whence F_1 gives 16 *Aa Bb Cc Dd*, or 20 leaves, and F_2 a greatly increased variability. The writer points out that these assumptions illustrate the idea, though in the actual cross the conditions are more complex, owing to the interaction of a greater number of factors.

EREAL AND
JLSE CROPS

1034 - **Cereal Experiments in the Texas Panhandle.** - ROSS, J. F and LEIDIGH, A. H. - *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 283, pp. 79. Washington, June 1913.

The so-called Texas "Panhandle" is that part of the State which projects northward between New Mexico and Oklahoma. Formerly the land was occupied by large cattle ranges, but these have been gradually replaced by farmers and agriculturists, and for the guidance of these later settlers, local experimental stations became a necessity. The first was established at Channing in 1903, and later was moved to Amarillo, while minor experiments have been carried out at two sub-stations.

The district is a high, dry, windy plain from 2000 to 4000 feet above sea-level. The annual rainfall varies from 18 to 23 inches and is irregularly distributed, a large proportion falling in torrential showers so that much of the water runs off and is lost to the land.

The atmospheric humidity is low, the evaporation is high, and violent fluctuations of temperature occur; sunshine is abundant and the nights are comparatively cool.

A large number of cereal crops have been tried and numerous varieties tested: of the small grain crops, winter wheat has proved on the whole the most profitable, but even in this case the yields are low and do not average 15 bushels per acre. Spring grain gave unsatisfactory results, and maize was quite a failure. But the grain sorghums proved the most dependable crop of all. During the 5 years 1907-11 the average yield of all varieties of milo at Amarillo was 23.5 bushels per acre, while some of the varieties averaged nearly 28 bushels per acre.

The trials have included variations in the time of seeding and in the amount of seed sown per acre, as well as a few tillage experiments, so that definite information on the best methods of cultivating the crops is now available for those farmers who require it.

FIBRE CROPS

1035 – **Manuring Experiments on Cotton in Italy.** — VARVARO, U. in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. XLVI, Nos. 4 and 6, pp. 275-282 and 385-392. Modena, 1913.

During the past few years there has become manifest a distinct movement in favour of the cultivation of cotton in Southern Italy, with the object of reawakening the interest of farmers in the crop and allowing it to assume once more the place it once occupied in Sicilian agriculture. In 1864 there were 83 650 acres under cotton in Sicily, producing 23 632 tons of lint, while at present the annual production has dropped to about 3 000 tons.

Manuring is usually neglected, though cotton requires a soil which has been will prepared and well manured, and the success of the whole rotation will be largely dependent on the manner in which these two processes have been carried out. In fact the cotton plant is a voracious feeder: a good crop of 1340 lbs. per acre removes from the soil:

Nitrogen	63 lbs.
Phosphoric acid	28 »
Potash	59 »

Counting the wheat which follows in the rotation at a proportional yield of 45 bushels per acre, the elements to be returned to the soil per acre would be as follows:

Nitrogen	146 lbs.
Phosphoric acid	72 »
Potash	115 »

The writer carried out some manuring experiments during the period 1911-1912, at Menfi (province of Girgenti) with the variety " Biancavilla " on a uniform calcareous loam of medium fertility and situated almost on level ground. The plots measured 100 sq. metres ($^1/_{40}$ acre approx.) each, and received the following treatment:

Plots	1, 7, 13	no manure
»	2, 8, 14	660 lbs. farmyard manure
»	3, 9, 15	green manuring with beans
»	4, 10, 16	*id* + 13 lbs. of mineral superphosphate
»	5, 11, 17	*id.* + *id.* + 4 ½ lbs. sulphate of potash
»	6, 12, 18	*id.* + *id.* + *id.* + 6 ½ lbs. gypsum.

The fertilizers were applied in November when also the beans were sown; the farmyard manure was spread previously.

The green crop was turned in on February 12th and the cotton seed was sown on March 17th.

The returns were as follows :

	No manure	Farmyard manure	Green manuring.	Green manuring. Superphosphate	Green manuring. Superphosphate. Sulphate of potash	Green manuring. Superphosphate. Sulphate of potash. Gypsum
Mean production per acre:						
Total . . . . lbs	648	784	735	865	999	1003
Seed . . . . . »	183	240	219	251	330	329
Lint . . . . . »	465	544	516	614	669	674
» . . . %	28.2	30.6	29.8	28.9	33.0	32.8
Time of harvest .	Aug. 26 to Oct. 9	Aug. 17 to Oct. 9	Aug. 10 to Oct. 9	Aug. 10 to Oct. 9	Aug. 4 to Oct. 9	Aug. 4 to Oct. 9
Receipts and expenses per acre:						
Total value of production (1) . .	£5 7s.	£6 19s.	£6 8s.	£7 6s.	£9 10s.	£9 10s.
Total cost of manure	—	£3 15s.	£1 1s.	£2 0s.	£3 0s.	£3 5s.
Value of unexhausted residue left in soil	—	£2 7s.	5s.	18s.	£1 7s.	£1 9s.
Value of manure removed by cotton crop . . .	—	£1 7s.	18s.	£1 2s.	£1 13s.	£1 16s.
Profit due to manuring	—	5s	5s	17s.	£2 10s.	£2 6s.

(1) The prices obtained were: 150 lire per quintal (2.2*d.* per lb.) for the lint, and 5 lire per quintal (£2.10s. per ton) for the seed.

The figures and general conditions of the experiments lead to the following conclusions.

I. The application of $12^{1}/_{2}$ tons per acre of farmyard manure raised the yield appreciably and favoured the early ripening of the bolls.

II. The green manuring with beans gave similar, though less marked, results ; the early ripening however was still more marked.

III. The addition of 5 cwt. per acre of superphosphate to the green manuring increased the yield, showing that the soil requires phosphoric acid.

IV. The further addition of 1 ½ cwt. per acre of sulphate of potash to the dressing again raised the yield and the power of early maturity of the plant, showing that the soil required a supply of readily assimilable potash.

V. The application of gypsum gave no useful results.

VI. The application of all the manures proved remunerative, green manuring together with superphosphate and sulphate of potash heading the list.

Finally, green manuring with beans takes the place of farmyard manure, which is wanting in Sicily, and supplies the soils with the organic matter they lack.

1036 – **The Renovation of the Abaca (Manila Hemp) Industry.** — SALEEBY, M. M. in *The Philippine Agricultural Review*, Vol. VI, No. 4, pp. 167-182. Manila, April 1913.

In value and importance the abaca crop of the Philippine Islands is second only to rice, and the necessity of reorganising the former industry on a sounder basis has recently been emphasized by a series of calamities, in the shape of typhoons and drought, which have struck the islands.

The writer points out some of the contributing causes for the present condition and suggests some practical remedies:

1. *Selection of suitable sites.* Plantations should be established on rich soils where they will receive an abundant rainfall uniformly distributed.

2. *Cultural methods.* Plants should not be set less than 13 feet apart; deep cultivation, which proved most valuable during recent droughts, should be practised, and the land irrigated wherever possible. The renewal of old plantations should not be carried out by setting new shoots between the old ones, but by establishing an entirely new plantation.

3. *Improvement of the quality of the fibre.* The following table will show that careful extraction yields a higher percentage of the good quality fibre, whereas a higher percentage of the poor grades is actually exported:

	Yield with careful extraction	Exported in 1912
Low grades	5	32
Current grades	10	40
Good current grades	25	18
Good grades	35	10
Best »	25	

The better qualities down to "good current" are put to special exclusive uses; the demand for them is considerably above the supply, and prices are not only very high but very stable, whilst the poorer qualities have to compete with other products, showing conclusively the immense advantage of increasing the output of the higher grades. To attain this end so long as a good defibrator is not available it will be necessary to concentrate efforts towards improvement on:

4. *The adjustment of relations between buyers and producers.* Producers frequently know of means which would enable them to obtain high quality fibre, but as the local buyers will not pay a sufficiently high price, the planter finds it more profitable to turn out lower grade produce. The buyers or middlemen on the other hand refuse the higher prices partly because, being at the same time merchants, they prefer to keep the poorer class of producers dependent on them and partly because they cannot themselves distinguish between the various grades of fibre and feel safer in buying the lower grades where the differences are more apparent. The writer suggests the following reforms in this connection: 1) the enlightenment of the uneducated class of producers by means of experimental fields, etc.; 2) the formation of planters' cooperative associations; 3) the creation of uniform standards for each quality.

1037 - **A Textile Plant from the Sudan.** — HOUARD, A. in *L'Agriculture Pratique des pays chauds*, Year 13, No. 121, pp. 277-291. Paris, April 1913.

The flower stalk of *Vigna catjang* var. *textilis* ("Kien") yields a fibre which the natives use for making string, but, for the present, it is of no economic importance. The writer gives an account of its botanical, agricultural, and commercial character.

OIL CROPS

1038 - **Cohune Nuts from British Honduras.** - *Bulletin of the Imperial Institute*, Vol. XI, No. 2, pp. 226-230. London, April-June 1913.

These nuts are the produce of the cohune palm (*Attalea Cohune*), native of British Honduras, where it occurs over two-fifths of the area. The yield per tree is about 2 cwt., corresponding to some 2000 nuts.

The kernels, which are rich in oil, are not used on a large scale because of their very hard shells. But as machines for breaking them are now being tried, it seems advisable to determine the characters of the product.

The fibrous covering of the fruit contains an oily substance which may be of value when the kernels are worked.

The following figures show the characters of the oil from samples of these nuts received by the Imperial Institute:

Specific gravity at 15°C	0.870	0.871	0.871	0.868
Acidity	3.5	13.1	1.2	20.4
Saponification value	255	256.5	256.5	252.4
Iodine value	13.6	13.7	11.4	13.7
Melting point of the fatty acids	19.8°	21.0°	20.2°	19.7°

From these figures it is seen that the oil is a good deal like coconut oil. The yield of the kernels in fat is about the same as that of copra. Kernels sent to Europe carefully packed and on a commercial scale should fetch about the same price as copra.

RUBBER, GUM AND RESIN PLANTS

1039 - **Tapping Experiments with *Hevea brasiliensis*.** — De Jong, A. W. K. in *Mededeelingen van het Agricultuur Chemisch Laboratorium*, No. IV, pp. 1-34. Buitenzorg (Java), 1913.

The writer gives the results of some Hevea experiments he carried out at Buitenzorg (Java) to determine the influence of the position and slope of the incision on the yield of latex:

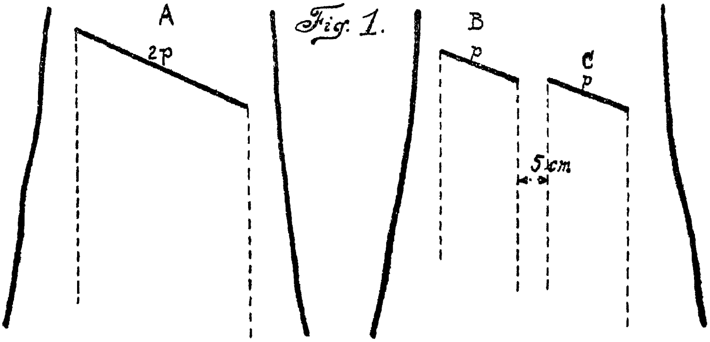

Fig. 1.

1) Incisions of equal length, made at equal height and in the same direction 2 inches apart give practically the same results.

2) Such incisions any given number (n) inches apart, and distributed all round the trunk also give the same results.

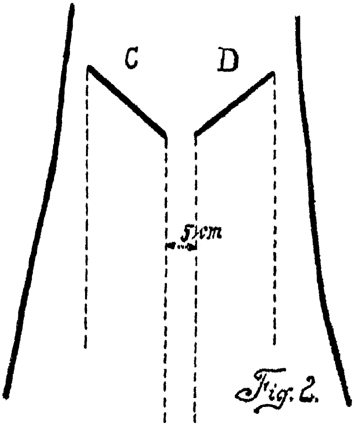

Fig. 2.

3) Considering on the one hand the incision A equal in length to $2p$, and on the other hand the two incisions B and C, in the same direction and at the same height as A, each being equal in length to p (therefore $B + C = 2p = A$), if the yield for A is taken as 100, two

series of experiments gave 119.7 and 123.9 for B + C, or in other words the double incision gave about 20 per cent. more latex than the single incision.

4) Keeping the other factors constant the writer tapped trees both to the left and to the right, the incisions being 2 in. apart. Taking the left-hand tapping, or C, as equal to 100, the right hand tapping, or D, gave 85.7, or approximately 14 per cent. less.

5) The writer also varied the distance between the incisions, which had been constant in the previous experiment, and still the yield of the left-hand tapping was to that of the right-hand tapping as 100 to 88.8, or an appreciable difference in favour of the former.

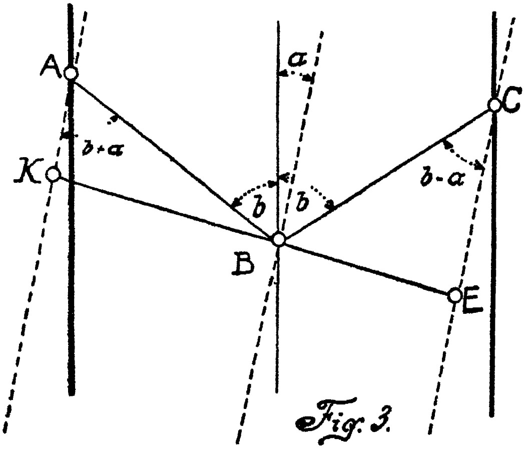

Fig. 3.

Interpretation of results. Petch, working in Ceylon, found that left hand tapping (C, fig. 2) usually yielded more latex than right-hand tapping and suggested the following explanation: the fibres of Hevea are not absolutely vertical, their general direction being that of a helix rising towards the right hand; the medullary rays and latex tubes will be inclined in the same direction, whence in the left-hand tapping more latex tubes are severed and consequently more latex is obtained.

Petch worked with a small number of individuals and the writer repeated the experiments to confirm the results.

Fig. 3 represents a longitudinal cut of a Hevea, the dotted lines representing the direction of the latex tubes. A B and BC are two opposite incisions both forming the same angle *b* with the direction of the tree trunk and being of unit length; *a* is the angle formed by the latex tubes with the direction of the tree trunk.

If Petch's hypothesis be correct, the quantity of latex yielded by A B and B C will be proportional to the lengths K B and B E (K E being perpendicular to the latex tubes); then

$$\begin{aligned} &KB \text{ being } = \sin(a+b) \text{ and} \\ &BE \quad \text{»} \quad = \sin(b-a) \\ &(\text{since } AB = BC = 1) \text{ therefore} \\ &\frac{\text{Yield of } AB}{\sin(a+b)} = \frac{\text{Yield of } BC}{\sin(b-a)}; \end{aligned}$$

b is known or easily measured; to obtain a value for a, the writer adopted several methods :

1) He removed a vertical strip of cortex and cambium, and moistened the wound with a potash solution, when the fibres appeared as white lines whose slope could be measured.

2) He first removed a vertical strip of cortex, and then removed the fibres from the tree, but the latter was a difficult process.

No constant value was obtained for a, and it even varied perceptibly between two points on the same tree, so that the writer was obliged to carry out a large number of measurements *on both sides of the tapping* in his experiments. When values were assigned to b and a in the equation I, it worked out approximately true, thus confirming Petch's hypothesis.

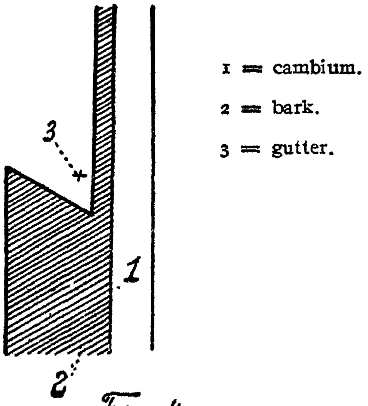

Fig. 4.

As to values for the angle a, the writer gives the following figures : Out of 316 direction experiments, in 7 cases the fibres had an upward inclination towards the left, in 9 cases they were vertical, and in 300 cases they had an upward inclination towards the right ; the mean for a was 3.7° to the right, and extremes varied between 5° to the left and 9.5° to the right.

During the 9 months' experiments the excess yield of the left-hand tapping over the right-hand tapping, which was 26 per cent. during the first three months, gradually fell to 16 per cent. during the next three months and to 12 per cent. in the last three. These differences should be attributed to the inexperience of the coolies who at the start, not being accustomed to left-hand tapping, removed too much cortex, and it is probable that 12 per cent. most closely appromixates the truth.

Conclusions.

1. Petch's hypothesis is a rational one.
2. As a method of tapping, the half herring-bone to the left is to be prefered to the herring-bone or half herring-bone to the right.
3. The ideal angle (*i. e.* the one yielding a maximum amount of latex for a minimum of cortex removed) would be at right angles to the latex tubes, but as the incision would then be almost horizontal, the latex would tend to run over the side instead of down the cut; to avoid this defect, the writer proposes that a little gutter should be formed (fig. 4) which would enable the slope of the cut to approximate more nearly the ideal angle without quite attaining it.

1040 - **Enquiry on *Manihot piauhyensis*** (1). - GIRARD, E. and CAYLA, V. in *Journal d'Agriculture tropicale*, Year 13, No. 144, pp. 161-165. Paris, June 30, 1913.

The writers give the results obtained with *Manihot piauhyensis* at An-Loc in Cochinchina.

The trees in question were planted between heveas standing at 16 by 33 ft., and were tapped over one-tenth of their circumference by means of five or six herring-bone cuts sloping at 45° and 4 inches apart.

These trees began to be tapped regularly in December 1912, at two and a half years old; their circumference at 3 ft. was then 12 to 16 inches. The experiments deal with the period December to March, which is the driest part of the year and corresponds to the slowest vegetative growth.

The mean daily yields were:

Dec. 1912	5.07	grams
Jan. 1913	5.30	»
Feb. 1913	6.75	»
March 1913	7.30	»

The general average is 6.13 gms. of fresh rubber, that is about 4 gms of dry rubber per day. Reckoning 200 tapping days a year, the yield at two to three years of age would be 800 gms. (nearly 2 lbs.), a really remarkable quantity.

A striking feature is the "formidable" development of the *M. piauhyensis* trees at An-Loc: some of those three years old cover more than 30 sq. yds. of ground, while in the Serras of Piauhy they are quite little trees.

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(1) See No. 367, *B.* April 1913. (*Ed*)-

As the climate of Cochinchina, with its dry season, is similar to that of the country of origin of the manihots, the Asiatic results must be due rather to the richness and depth of the plateau soils, and especially to their water-content; indeed the manihot regions of Brazil are almost water-less.

The writers consider *M. piauhyensis* the most likely species of *Manihot* owing to its precocity, its yield, and its resistance to drought.

VARIOUS CROPS

1041 - **Tea: its Cultivation, Manufacture and Commerce.** - CHANDLER, S. E and MC EWAN, JOHN in *Bulletin of the Imperial Institute*, Vol. XI, No. 2. pp. 252-319. London, April-June 1913.

The writers give a summary of the cultivation and preparation of tea and then go on to the chief countries producing it.

The world's production in 1912 was about 731 million lbs., distributed as follows (in millions of lbs.):

India	295	Java	63
Ceylon	193	Japan	42
China	112	Formosa	25

A calculation of the consumption per head of population gives 6.2 lbs. for the British Empire and 0.63 lb. for the rest of the world, showing what heavy tea-drinkers the British people are.

British India. — Assam and Bengal make up nine-tenths of the area under tea in India. The progress made since the beginning of tea-growing is shown by the following figures:

Year	Area under tea acres	Esportation of tea lbs.
1838	—	488
1877–78	188 000	36 000 000
1911–12	575 000	264 000 000

The progress is due to two causes:

1) Increase in yield per acre. This varies greatly according to the district (23 lbs. per acre in Western Bengal and 585 lbs. in Eastern Bengal), but in general it has increased 100 per cent. since 1875.

2) The "tea cess". This contribution, which was volontary in 1893 and obligatory in 1903, has just been renewed (1913); it has allowed the opening up of important markets for Indian tea in Russia and America.

Green tea has assumed considerable importance in the last few years:

1909	2 678 000 lbs.
1911	5 210 000 »

Ceylon. — This is the most important rival of India in the tea trade. The progress made has been remarkably rapid:

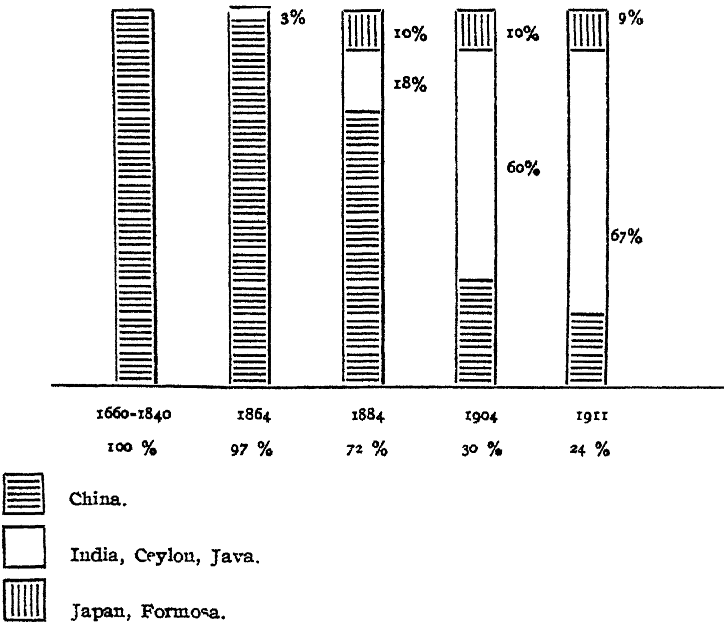
Year	Exportation lbs.
1873	23
1883	1 666 000
1909	192 886 000

For some time the movement has been slowing down, especially owing to the popularity of hevea; it is still, however, the chief crop of the island.

Java. — The yields obtained here are very good, but the better qualities are rare: this is probably due to the nature of the soil.

Early on the exportation remained stationary, being 7 029 000 lbs. in 1884, and 7 062 000 lbs. in 1890; then it rose rapidly to 15 405 000 lbs. in 1900, and actually tripled in the next ten years, reaching 50 518 000 lbs. in 1911; there was a still further increase of 20 per cent. in 1912, to 61 438 000 lbs.

China. — Considering her local consumption, China is probably still the largest tea-producer; but on the world's market, formerly entirely supplied by her, China tea only amounts to 24 per cent. at present. The adjoining diagram shows this decrease.



Japan. — In Japan, tea is often grown as continuous hedges, instead of separate bushes; systematic pruning is only carried out every ten years. In the Uji district, tea is grown under shelters; the product is much appreciated, but is all consumed locally.

For some years the area under tea has been diminishing, but the production has kept on rising:

1902	56 000 000 lbs.
1911	70 000 000 »

The United States take half this amount.

Formosa. — The famous Oulong teas are chiefly exported to the United States. Their special qualities seem to be due to: 1) special varieties, which are at present being studied; 2) propagation by layers (the only example in the world): the best bushes give very little seed, and layers seem to be the only means of keeping all the qualities intact; 3) particular method of preparation, having points in common with those of both black and green teas.

Africa. — Natal is the only tea-producer of any importance outside the East, and its exportation is so far only 2 140 000 lbs. (1911). Lack of labour prevents the extension of this crop.

1042 - **The Production of Coffee in the French Colonies: its Importance in the Consumption of the Mother-Country.** - BERTEAU, A. in *Bulletin de l'Office colonial*, Year 6, Nos. 64-67, pp. 97-112, 146-157, 186-202 and 209-230. Paris, April-July, 1913.

The writer gives the history of coffee-growing in the various French colonies, with many statistics to illustrate it.

Martinique. — After showing the fluctuations since 1835, the writer notes the slight importance of real Martinique coffee on the European markets at present.

Guadeloupe. — From 1790 on, this colony was damaged successively by wars, diseases and the abolition of the slave trade; in the last few years it alone has furnished half of the total exports from the French colonies (1 715000 lbs. in 1910). While in Martinique and the neighbouring British Antilles coffee has dwindled almost to the point of disappearing, in Guadeloupe it has shown a slight tendency to rise.

Ivory Coast. — The exports of 1910 (76 450 lbs.) show an increase over those of the previous year (64 150 lbs.).

French Congo. — In 1896, of the 9850 lbs. exported, only 295 lbs. were destined for France. But since 1900 almost all the Congo coffee has gone to the home-country; in 1910 this amount was 106 870 lbs. out of a total exportation of 106 980 lbs.

Madagascar. — The following figures show the progress made: in 1901 the exports were 258 lbs; in 1903, 3 100 lbs.; and in 1910, 243 980 lbs. The production of this colony is coming to be of importance.

Réunion. — Between 1830 and 1840, the island exported over *two million pounds* of coffee a year; various calamities fell upon the island, and the exportation in 1910 was only 258 250 lbs.

New Caledonia. — The introduction of small colonisation (with small holdings) brought the exportation up to 1 380 750 lbs. in 1903, but the ignorance of the planters as regards tropical agriculture reduced it to 651 090 lbs. in 1905; since then, better organization of the coffee plantations has helped matters, and the figure for exports from the colony in 1910 stood at 1 143 700 lbs.

Indo-China. — Coffee seems to do well in this colony, witness the following figures:

1899	770 lbs.
1901	5 117 »
1910	508 835 »

Consumption. — Almost the whole of the coffee from the French colonies is imported by the mother-country, but this amount represents only the *sixty-fifth part* of the total French consumption.

1043 - **Contribution to the Study of Vanilla.** — ADVISE-DESRUISSEAUX, P. in *L'Agriculture pratique des pays chauds*, Year 13, No. 121, pp. 265-276. Paris, April 1913.

In growing vanilla, it is important to gather the fruits in their optimum state of ripeness, as otherwise the prepared product has a lower market value.

The writer sums up the characters of vanilla ready for preparing:

1) whole surface dull;

2) both lateral lines yellow;

3) the lines below the epidermis yellow or yellowish green, giving the whole fruit a slightly yellow tinge of green.

In these conditions: 1) the vanilla is sufficiently ripe; 2) it can hang some time, which allows the pickings to be spaced out, so economizing labour; the "yellow tip" criterium is not a guarantee of ripeness, and entails more frequent pickings.

The planter should attempt to obtain a product as heavy as is compatible with quality; the writer has therefore investigated the influence of cultural methods on the density of the pods. He finds that fruits ripened in the shade are denser than those ripened in the sun; the loss of sun-ripened pods is 4 per cent.

To obtain heavy pods, if the supporting trees will not keep their leaves till after the fruit is picked they should be headed back two or three months after they come into leaf; the physic-nut (*Jatropha Curcas*) is useful as a support.

In very moist countries, vanilla ripened in the sun is found to be richer in perfume than that ripened in the shade. In this case the planter must decide what pays him best.

1044 - ***Sophora glauca.*** — *The Planter's Chronicle*, Vol VIII, No. 21, p. 302. Bangalore, June 28, 1913.

Sophora glauca is very abundant in the Nilgiris, Shevaroys, Coory and Mysore. The following analysis was made by the Government chemist at Coimbatore:

	Per cent. of dry matter	Per cent. of ash
Nitrogen	2.57	—
Phosphoric acid	0.54	9.73
Potash	1.35	24.14

This plant is therefore rich in nitrogen and potash. Mr. Harrisson recommends it as a green manure for tea and coffee; it is particularly useful when it can be cut in the jungle and brought to the plantation.

1045 - **On a Graft-Hybrid between Peach and Almond.** — DANIEL, L. and DELPON, J. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 26, pp. 2000-2002. Paris, June 30, 1913.

FRUIT-GROWING

In 1905 a vigorous almond tree at Mas-Grenier (Tarn-et-Garonne) was cut back to a short distance above the butt. It threw up a certain number of shoots which were budded in August, when growth had ceased, with buds from a yellow-fruited peach commonly grown in the neighbourhood, which had never shown any variation. The following spring, all the buds grew well, and that autumn there were already some fruit-buds. The following year these flowered at the usual time and gave yellow-fleshed peaches exactly like those of the variety from which the grafts were taken.

In the third year, all the shoots began to change in a curious way. The flowers, though like peach flowers, gave fruits more or less intermediate between peaches and almonds. The flesh was rather thin, soft, tender and coloured like that of the peach, but of distinctly poor quality. The stones were intermediate in varying degree, as regards size, shape and furrowing, between normal peach and almond ones.

A point of interest was that the hybrid shoots did not arise from the graft callus, as usually happens with such occurrences (*Cytisus Adami, Crataegomespilus Dardari, Pyrocydonia Danieli*). The grafts bore none of them within a foot of the point of union. Towards the centre of the tree pure peach and almond shoots occurred isolated. There were also here and there fruiting branches of three sorts: pure almond, pure peach, and intermediates. Sometimes a single branch bore both peach and almond leaves. The habit of the graft differed from that of both species; the shoots were more upright and regular and formed an almost hemispherical crown. These phenomena were repeated in the following year, so that the variation was fixed. But as the owner found this curious tree of no use in practice, he destroyed it.

Two stones from the grafted tree have germinated; one of the young trees is vigorous, the other weakly; neither has yet flowered. The leaves show that they have some points of resemblance with both peach and almond. The stipules of the first are large and drop late, as with peach, but the teeth of the leaves are large and regular as in almond; numerous leaf-nectaries are arranged as in peach, and the veins are also like those of peach leaves. The anatomical structure of the petiole and blade recalls that of the almond. The stipules of the second tree are deciduous and small, as in almond, but the arrangement of the nectaries and teeth is like that of peach leaves ; the veining is closer, as in almond. The structure of the petiole and blade is about as in the peach.

The chracters of the graft-hybrid here described, with leaves, fruits and stones intermediate between those of the stock and the graft, show considerable resemblance to those of *Amygdalus communis persicoides* Ser. of horticultuists ; this is considered as a sexual hybrid, but its origin is not really known. It seems more reasonable to suppose that it is really a graft hybrid which has been multiplied without its being known what it was.

Its occurrence at a good distance from the graft-callus shows that graft-hybridization may take place at a varying distance from the union of the tissues, and this agrees with the phenomena recorded by one of the writers in the case of egg-plants and capsicums grafted on tomatoes, as well as with grafted vines. It also recalls the cases recorded by horticulturists a few years ago of pure almond shoots appearing on peaches on almond stock; but in this hybrid the reaction was much more complete, as, besides the pure shoots of stock and graft occurring side by side, there were organs in varying degrees intermediate between the two species (leaves, fruits and stones) ; in fact it presents a mosaic of poecilodynamic characters, while those previously recorded for peach were mosaics of dichodynamic characters.

1046 – **Olive Growing in Tunis.** – CAMPBELL, C. in *L'Agricoltura Coloniale*, Year VII, No. 6, pp. 201-215. Florence, June 1913.

After some information on the conditions of soil and climate under which olive growing is carried on in Tunis, the writer remarks that the botanical and biological sides of the question have not been equally well studied. He gives a summary of his previous publications on this subject. A description is given of the M'gharsa contract, according to which the Arab cultivator takes all the produce of the olive grove for ten years so as to pay the expenses of cultivation ; after this the proprietor takes half the produce of the grove, now in full bearing.

The article concludes with the following remarks: 1) the problem of olive growing in North Africa may be summed up in the botanical and biological study of the cultivated and wild olive; 2) large nurseries should be established in various places so as to undertake the selection of trees which will bear without grafting; 3) new varieties should be created for special biological conditions; 4) species of *Olea* that might be useful as stocks should be grown.

1047 – **Manuring of the Carob.** — DI MATTEI, V. *Le piante arboree in provincia di Siracusa*, Part IV (La coltivazione del carrubo); pp. 81-86. Syracuse, 1913.

The cultivation of the carob in Italy is almost confined to the province of Syracuse (Sicily). In the five years 1890-94, out of a total production of 82 500 tons, 45 000 were produced in the province of Syracuse, and 30 000 in that of Cagliari (Sardinia), the rest in other parts of Sicily and in Apulia. The varieties of *Ceratonia Siliqua* L. grown in the province of Syracuse are: *saccharata, latissima, racemosa* and *falciata.*

This Leguminous tree is generally grown in dry and stony ground, associated with cereals alternating with pasture and fallow; but this treatment does not allow it to reach its full yield. Manuring is little practised; to determine its influence the writer started an experiment in the territory of Syracuse, on a plantation 20 years old with marly soil.

Six groups of five equally grown trees were selected; the first dressing was applied on the 21st of October 1908, the manure being spread in basins about 8 inches deep over the area shaded by each tree; the second application was made on the 9th of December 1910, and the third on the 2nd of February 1913. The amounts applied per group were as follows:

Group	Mineral superphosphate — lbs.	Sulphate of potash — lbs.	Sulphate of ammonia — lbs.	Nitrate of soda — lbs.
I . .	—	—	—	—
II .	$8\,^{3}/_{4}$	2 ¼	2 ¼	—
III . .	$8\,^{3}/_{4}$	3 ¼	2 ¼	—
IV .	$8\,^{3}/_{4}$	4 ½	2 ¼	—
V . .	$8\,^{3}/_{4}$	—	2 ¼	—
VI . . .	$8\,^{3}/_{4}$	2 ¼	—	$2\,^{3}/_{4}$

The yields were as follows:

Group	1910 — lbs.	1911 — lbs.	1912 — lbs.	Total — lbs.
I	463	399	817	1 679
II	758	99	1 214	2 071
III	780	97	1 124	2 001
IV	771	346	1 388	2 505
V	551	70	1 159	1 780
VI	577	320	1 102	1 999

In 1909 and 1913 there was no crop, and in 1913 the trees were also severely attacked by mildew (*Oidium Ceratoniae* Comes).

The main conclusion is that the increased yield does not pay for the expense of digging the basins and the cost of the manure; for this reason the writer recommends indirect manuring through the leguminous forage or seed crop grown between the trees. He recommends the following dressing per acre: mineral superphosphate 630 lbs., sulphate of potash 90 lbs., sulphate of ammonia 45 lbs. Manure should also be given if the trees are headed back, as is commonly done.

LIVE STOCK AND BREEDING.

HYGIENE

1048 - ***Schistosomum turkestanicum* Skrjabin, new Parasite of Cattle in Turkestan.** - SKRJABIN, F. K. in *Zeitschrift für Infektionskrankheiten, parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 13, Part 7, pp. 457-468. Berlin, July 5, 1913.

The parasite found by the writer in the *vena porta* of numerous head of cattle in the Syr-Daria region has a great resemblance to *S. bomfordi* Montgom., but differs sharply from it in the shape of its eggs. These are oval, pointed at their extremities and all of them differing from each other. Their length varies between 0.0725 and 0.0740 mm., and their breadth between 0.0222 and 0.026 mm. By the number of vescicules of the testicles, this species approaches the schistosomes of birds.

Besides being distinguished from other species by the shape of its eggs it differs also in its outer structure (*S. turkestanica* Skj. being sickle-shaped), in the conformation of its male sexual glands and of other interior organs.

The writer describes the species very minutely.

1049 - **On the Presence of Tubercle Bacilli in the apparently Healthy Udder Tissue of Tuberculous Cows.** - ISHIWARA, T. in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 70, Part 1-2, pp. 1-9. Jena, July 29, 1913.

The writer examined for tubercle bacilli the apparently healthy udders of 26 very tuberculous cows at the slaughter yard of Munich, and in 19.3 per cent. of the cases found macroscopic latent tuberculosis of the udder. Considering the small number of bacilli found in the five udders the writer as well as Ostertag come to the conclusion that clinically healthy animals, even when they give reaction with tuberculin do not pass bacilli into the milk. On the other hand the milk of clinically tuberculous cows, even when the udders appear to be healthy, should not be used unless previously boiled.

ANATOMY AND PHYSIOLOGY

1050 - **Left-Sided Bearing in Cows.** — GIOVANOLI, G. in *Schweizer Archiv für Tierheilkunde*, Vol. 55, Part 7, pp. 376-380. Zürich, July 1913.

A description of many cases of left-sided bearing. The writer considers such cases to be of much more frequent occurrence than is generally supposed. According to him, as a rule, cows can bear on the left and the right sides alternately without thereby producing mal-formed calves. If calves borne on the left side are mis-shapen, which need not always be the case, the cause is the confined position in the uterus. The observations of the writer have not confirmed Wundt's opinion that left-sided bearing produces digestive disturbances in cows.

1051 – **The Correlation between Genital Glands and Dentition.** — ROBINSON, R. in *Comptes-Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 156, No. 26, pp. 2016-2018. Paris, June 30, 1913.

According to the observations made by the writer in the cases of the ass, dog and man (which are described in this work) there is an intimate correlation between the male genital glands and the dental system. If the genital glands are removed early, or their secretion is strictly limited throughout life, the nutrition of the teeth and their consequent development and powers of resistance are superior to when sexual activity commences soon and is continually much exerted.

The writer considers the nutrition disturbances which often occur in the case of syphilitic and tuberculous persons to be partly due to injuries to the reproductive organs. Conversely the entire removal of the teeth in the case of man may cause atrophy of the genital glands, and even occasionally sterility.

1052 – **Researches Respecting the Boron Content of Milk and Eggs.** — BERTRAND, G. and AGULHON, H. in *Comptes Rendus Hebdomadaires des Seances de l'Académie des Sciences*, Vol 156, No. 26, pp. 2027-2029. Paris, June 30, 1913.

According to the analyses of the writers, one litre of human milk contains 0.08 mgm. of boron, while the same quantity of ass' and of cow's milk contains 0.1 mgm. and 0.2 mgm. of this element respectively. In birds' eggs, contrary to what occurs in the case of iron and manganese, boron is localised, not in the yolk, but in the white. The boron content of 1 kg. of the white of hen's, turkey's and goose's eggs is 1 mgm.

The writers conclude that boron, which was found in every analysis, is a catalytic constituent of the animal cell.

1053 – **The Presence of the Barred Plumage Pattern in the White Leghorn Breed of Fowls.** — HADLEY, P. B. in *The American Naturalist*, Vol. XLVII, No. 559, pp. 418-428. New York, July 1913.

BREEDING

When White Leghorn cocks were crossed with Black Hamburg hens, the resulting F_1 generation were all white, but not pure white however, for every individual had some fleckings, though in some cases the latter were extremely inconspicuous. In a small proportion of birds, both males and females, there were present from one to three wholly barred or more often partly barred feathers. The F_2 generation yielded blacks, greys, whites, splashed whites, and barred birds, the barring in the latter covering the whole body and resembling the marking in the old unimproved Plymouth Rock breed. The proportions in which the different types appeared were as shown in the table on p. 1384.

The Black Hamburg parent could not carry the barring factor unless it also carried an inhibitory factor for barring; therefore the writer assumed that the barring factor (*B*) was carried by the White Leghorn parent, for which factor it was homozygous as well as for the factor (*I*) which inhibited the manifestation of black in the plumage. He assumed further that the male was homozygous for the absence of the female sex factor (*F*) for which the females were heterozygous, and that both parents carried a factor

	Total No.	White	Black			Barred			Grey
			♂	♀	?	♂	♀	?	
1911	117	90	0	9	3	4	2	5	4
Expected .	**117**	**87 $^3/_4$**	**0**	**7 $^5/_{16}$**		**14 $^{10}/_{16}$**	**7 $^5/_{16}$**		
	117	90	16 (1)			11			
Expected. .	**117**	**87 $^3/_4$**	**7 $^5/_6$**			**21 $^{15}/_{16}$**			
			♂	♀	?	♂	♀	?	
1912	137	106	0	6	1	14	6	4	
Expected. .	**137**	**102 $^3/_4$**	**0**	**8 $^9/_{16}$**		**17 $^2/_{16}$**	**8 $^9/_{16}$**		
	137	106	7			24			
Expected. .	**137**	**102 $^3/_4$**	**8 $^9/_{16}$**			**25 $^{11}/_{16}$**			

(1) Includes the 4 grey fowls.

for black pigmentation and a colour factor; but since it seemed probable that none of the birds in the experiment lacked these factors, they could be omitted from the formulae, which thus became *BB ff II* and *bb Ff ii* respectively.

Lastly, he supposed that in gametogenesis the factor *B* was repelled by *F*. Under these conditions the results of mating should be as follows: for every 16 birds in F_2, 12 should be white, 3 barred and 1 black. The whites should be equally divided between the sexes; of the 3 barred birds, 2 should be male and 1 female; the one black should be a female. Moreover one of the barred males should be homozygous for this factor, while the other male and the female should be heterozygous. Other birds, including both males and females, should carry the barring factor but not manifest the pattern, since they would also be either homozygons or heterozygous for the inhibiting factor *I*.

The figures given in the above table correspond fairly well with the expected so far as the ratio white to dark of 3 : 1 is concerned; and with regard to the discrepancy of the barred to black ratio in 1911, the low number for barred birds may be partly explained by the fact that it is impossible to distinguish blacks from barred in very young chicks. In the 1912 results all chicks which died under 3 weeks old were excluded, and the figures conform closely with the expected. In both years the ratio of barred males to females agrees well with the expected 2 : 1.

Similar evidence with regard to the possession of a homozygous barred character by white Leghorn males was obtained when cocks of that breed were crossed with Black Minorca, Black Java, and Black Spanish hens, but no cross involving the White Leghorn hens has yet been made.

1054 - **On Sex-Limited Inheritance in Cats, and its Bearing on the Sex-Limited Transmission of Certain Human Abnormalities.** — DONCASTER, L. in *Journal of Genetics*, Vol. 3, No. 1, pp. 11-23. Cambridge, June 1913.

The question as to whether sex-determination is dependent on the male or the female gamete is still unresolved, as is also the nearly related question of how far sex-limitation is absolute when it occurs, and this in spite of the fact that the hypothesis most widely adopted for the explanation of sex-limited trasmission assumes that the sex factor and the factor for the sex-limited character are borne by the same chromosome.

With a view to obtaining fresh evidence on these two points, the writer collected and analysed the data dealing with certain sex-limited affections in man: colour-blindness, night-blindness, nystagmus, and haemophilia. In all four cases, there was an apparent disturbance of the sex-ratio among the offspring of trasmitting females, an excess of affected over unaffected males in affected fraternities, and occasional exceptions to the ordinary rule of sex-limited transmission among the children of affected males. However, on further examination it became evident that there were several possible sources of error in the results, due chiefly to the impossibility of distinguishing a transmitting female unless she has at least one affected son. When certain corrections were applied, the excess of affected over unaffected males in affected fraternities was greatly reduced and the existence of this excess was of importance for the purpose for which the enquiry was undertaken, for in some cases at least sex-limitation was not absolute, but was partial like gametic coupling of other characters, and it seemed possible that the excess of affected over normal males among the sons of transmitting females might be due to the partial coupling of the factor for disease with a sex factor among the gametes of the female parent. The factor for the affection was absolutely or almost absolutely coupled with a sex factor in the gametes of the affected male, for he transmited the factor only, or almost entirely, to his daughters, his sons being very rarely, if ever, affected. If then it were also found that a woman bearing this factor transmitted it chiefly to her sons, there would be absolute sex-limited transmission by one sex, and partial sex-limited transmission by the other sex in the same species.

A basis would thus be provided for a reconciliation of the two types of sex-limited inheritance, exemplified respectively by *Abraxas* and birds on the one hand, and by *Drosophila* and mammals on the other. If this were the case, the high ratio of affected sons of a transmitting woman should be associated with a low ratio of transmitting to non-transmitting daughters; the material examined gave no evidence that this was the case, but as mentioned before the available data were too incomplete to lead to any definite conclusions about the nature of the transmission of these human abnormalities.

On comparing the summary of the human pedigrees with data collected on colour inheritance in cats, it appeared probable that the latter might be able to throw some light on the question, as the transmitting female in this case is visibly different from the non-transmitting.

Orange colour in the cat was taken as analogous to abnormality or to the sex-limited affection, while black corresponded to normality. The orange colour is dominant over black in the male but only partially dominant in the female, so that the female heterozygote is tortoiseshell. In general, an orange male mated to a black female gives black male and tortoiseshell female kittens; in the converse cross, orange female by black male, the male kittens are orange, the females tortoiseshell. The orange male thus usually transmits orange to his daughters only, the orange female transmits it to all her offspring of both sexes. A tortoiseshell female by black male gives orange and black males, tortoiseshell and black females; showing that a female heterozygous for orange transmits the orange factor to some kittens of both sexes.

A summary of the results of over 100 matings showed their similarity to those obtained in the case of the human diseases. In the offspring of the orange male mated to black female there was some excess of females (61 ♀ : 50 ♂), as is also the case among the offspring of men affected with disease, while in the offspring of tortoishell females by black males there was a considerable excess of males (67 ♂ : 35 ♀). Further there was evidence that the sex-limitation of the orange character by the male was not absolute, and that there was an excess of transmitting over non-transmitting daughters (21 : 12). The numbers are small, and further data are required before they can be regarded as significant, but they give no support to the suggestion that the excess of affected males was due to partial coupling of the factor for the affection with a sex-factor in the gametes of the transmitting female.

Until more data are collected, it seems of little value to attempt to express the facts in a factorial scheme, but certain suggestions are made towards such a scheme, and an indication is made of the experiments which would be necessary to verify the hypothesis in so far as coat colour in cats is concerned.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

1055 – Three Years' Work of the Ferndale Cow Testing Association (California).

— ANDERSON, L. in *Agricultural Experiment Station, Bulletin* No. 233, pp. 459-482. Berkeley, California, September 1912.

The first Cow Testing Association in the United States originated in Michigan in 1905, and four years later the above Society was organised at Ferndale in Humboldt County, California. The latter's results for the past three seasons are now available and present some interesting figures Approximately 600 cows have been under control and the average yield of milk rose from 5 900 lbs. per head per annum in 1909 to 6 890 lbs. in 1911, while the butter fat yield increased from 251 lb per head per annum to 291 5 lbs. in the same time Each member pays from 80 cents (3s. 4*d*) to 1 dollar (4*s* 2*d*) per cow per annum and the tester receives 60 dollars (£12 10*s*) a month besides board and lodging and travelling expenses. The cows are tested once a month, but so far no attempt has been made to control the food consumed, as the animals are pastured during three quarters of the year.

1056 - **The General Show of Breeding Stock, Paris, 1913.** — VACHER, MARCEL in *La Vie à la Campagne*, Vol. 14, No 165, p. 63 Paris, August 1, 1913

The writer gives a short review of the successes attained by different breeds of cows, sheep and pigs in this year's show and compares the results with those obtained in previous years He bases on the latter his suggestions of the improvements which should be aimed at in breeding

HORSES, ASSES AND MULES

1057 - **Inheritance Studies at the Royal Stud of Trakehnen (East Prussia).** - SCHMIDT, BRUNO in *Arbeiten der Deutschen Gesellschaft fur Züchtungskunde*, Part 15, pp. 1-359. Hanover, 1913

The royal stud of Trakehnen, which was established in 1732 by the amalgamation of scattered studs, was at first Crown property, and as such was entrusted with the duty of breeding the saddle and carriage horses required by the court of the king The stud became State property after the death of Frederick the Great, and only attained importance in horse breeding when its stallions were employed for promoting the breeding of native horses, and then the Littau breeding depôt was established for this purpose in 1787 Since then the Trakehnen stud has been the centre for producing East Prussian pedigree half-breds. According to the writer, the different breeding stations form a large homogeneous stud founded by the chief stud of Trakehnen. If we examine the pedigrees of the stallions which were used for service shortly after its establishment, we find the most different blood represented; it is therefore to be concluded that systematic breeding was not practised at first. Of the stallions imported up to 1749, 19 were of unknown origin, 5 were English, 5 Rosenburger, 1 Berber, 1 Neapolitan Nevertheless, it appears that already at this time the Trakehnen products were good carriage horses. Especially suitable for this purpose were the descendants of the white Persian stallion, *Persianer*, used for breeding from 1739 to 1747, those of his son *Spinola*, and the offspring of the bay stallion, *Pitt*, the Champion trotter The writer considers that these three stallions, which he has found in the pedigrees of a large number of first-class breeding animals, were the founders of the old Trakehnen breed. Systematic breeding was introduced for the first time by Count Lindenau. The general inspector of horse-breeding appointed in 1886, devoted special attention to increasing the number of brood mares and eliminating hereditary faults.

He had scarcely acquired the necessary stud of brood mares, when war broke out in Prussia, causing a period of inaction and retrogression in breeding operations at Trakehnen. While towards the close of the eighteenth century there was a growing tendency to cross pure bred Arab horses with continental breeds, at the commencement of the nineteenth century, the Arab horses were increasingly replaced by English Thoroughbreds. Later, English half-breds also began to be imported.

Nevertheless, von Burgsdorf, who was Inspector General from 1814 to 1843, was not decided as to the best method to be adopted, for he gave the preference first to pure-bred Arabs, then to English Thoroughbreds, afterwards using Arab stallions again and finally deciding in favour of English Thoroughbreds. More noticeable progress in breeding was made under Schwichow, who was Inspector General from 1847 to 1864 and aimed at crossing for increased vigour. When he had attained his object, he tried to improve the breed by the introduction of pure blood ("Veredelung"). From 1860 almost all the imported stallions were noted English Thoroughbreds. At the present day, there is once more a tendency to limit the use of Thoroughbreds.

While giving a rapid review of the development of the stud, the writer also mentions the results of investigations made respecting the composition of the blood ("Blutaufbau") in the families of the best stallions. By means of pedigrees, which are in part reproduced in the text, he shows which stallions have founded families, how long and for what reasons the descendants of the said stallions have been used for breeding and the influence which they have exerted. The writer has studied 23 lines of stallions in this way.

The analysis and the comparative study of the pedigrees show that the best breeding results were obtained by in-breeding, and that at Trakehnen an effort was made as far as possible to unite the best lines of the same blood, *i. e.* to improve the blood. Those families which were no longer inbred maintained their position on the stud books for a relatively very short period compared with the others.

Valuable families were also rejected owing to fashion in coat colour and other reasons. Many stallions did well and founded families only because they were mated with suitable mares, while others with faultless pedigrees and upon which great hopes were built, retired from the breeding ranks without leaving any traces of their blood because they had not been provided with fitting mates.

At the end of this chapter, the writer deals briefly with the changes which have taken place on the breeding stock at Trakehnen in the course of time. Though the latter was heterogeneous at the commencement, and consisted of Slav, Danish Mecklenburg and Oriental blood, the breeding gradually developed, thanks to the introduction of English half-breds and Thoroughbreds, and has produced a type characterised by constancy, homogeneity and race purity. This has, however, been accomplished only by always using first-class stallions, endeavouring to eliminate original differences without introducing others, and by practising improvement of the blood ("Blutveredlung"). If the large amount of good blood in the Trakehnen horse is not visible at first sight, this is due to the fact that, at present, the principal object in breeding is to obtain a stronger frame.

The following chapter treats of the formation of blood in the mares' families. The writer deals with 20 out of 400 families, basing his observations on their pedigrees. In the case of mares, as in that of stallions, it is stated that the best blood is obtained by inbreeding. Good results are also often produced by crossing and subsequent systematic selection of those individuals which, by a happy combination of circumstances, prove to be of value.

The next chapter treats of the inheritance of coat colour. The writer first gives a summary of the work of Dr. Crampe on this subject, and then attempts by means of examples to explain on Mendelian lines the inheritance of coat colour.

White is dominant over all other colours in horses; a white horse can only be obtained if one of its parents is white, but white horses when mated do not always produce white offspring. Chestnut is always a recessive colour. Bay is recessive as regards white and dominant as regards chestnut.

It is however not possible by means of Mendel's theory to foretell which colour will prove dominant. According to the writer, more light is thrown upon this question by an examination of the animals' pedigrees; thus he cites instances of great power of coat colour transmission taken from the breeding records of Trakehnen and based on colour pedigrees. Contrary to the opinion of Von Öttingen, the writer considers that a black coat can be transmitted with a fair amount of constancy. The writer attributes the presence of white hairs to the use in in-breeding of white horses.

In conclusion, the writer has examined all the Trakehnen breeding material from the point of view of the transmission of hereditary defects. His observations have led to the conclusion that a pathologic fold of the eyelids is hereditary. The transmission of this defect seems to be more marked in the maternal line. At Trakehnen, periodic opthalmia was found to be hereditary in some cases, and not in others. The writer considers that tick is hereditary and can be transmitted by animals which have not got the disease.

Roaring was also proved to be hereditary. Spavin, navicular disease (Schale) and broken windedness were not transmitted. The writer, however, believes that the two first diseases can be transmitted by animals which are much affected by them. It seems that there may be a predisposition in foals to paralysis. The text is accompanied by many portraits of stallions of the best lines.

1058 – **Crisis in Saddle-Horse Breeding in the South and South-West of France.** –
1. RAYNAUD, M. La Crise du Cheval de selle dans les Charentes. — *La Vie Agricole et Rurale*, Year 2, No. 31, pp. 128-129. Paris, July 5, 1913. — 2. COURRÉGELONGUE, M. La Crise du Cheval de selle du Midi. — *Ibid.*, pp. 130-131.

There has been, for some years past, a considerable decrease in the number of saddle horses bred in the South and South-West of France.

Between 1904 and 1909, the number of saddle horses bred decreased by 32 per cent. (mares 40 per cent.) in South-West France, 26 per cent. in Central France and 35 per cent. in the Vendée and the Charentes. On the other hand, there was an increase of 4 per cent. in Morbihan, of 20 per cent. in Côtes-du-Nord and of 53 per cent. in Finisterre.

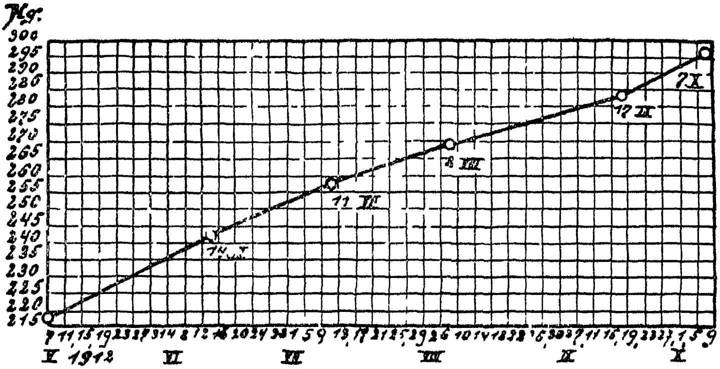
The chief reasons for the decline of the industry are, according to the writers, the increase in cattle, sheep and mule breeding, and especially the unremunerative nature of breeding remounts. In the South of France, a three and a half year old saddle horse costs the breeder on an average £ 53 10*s*, while the Remount Department has hitherto seldom paid more than £ 38 for such an animal. Thus the breeder loses £ 15 on the transaction. Should the horse not be purchased by the Remount Department, the loss is still heavier, since the State is the best customer. Seeing the great importance of saddle-horses in the South and South-West of France, both for the army and for agricultural purposes, the writers recommend the adoption of the following measures for encouraging horse breeding.

1. The distribution of the State premiums in proportion to the number of horses bred for the army by each region.
2. The increased purchase of three-year-old remounts and the raising of the price of remounts.
3. The granting of premiums to breeders who retain the best brood-mares for their own use. There should be three classes of prizes (£ 16, £ 12, £ 8) according to the value of the mares.
4. The giving of an annual prize to the breeder each time a mare in his possession is in foal which has been served by an approved or State stallion.
5. The organisation of saddle-horse shows after the pattern of the general cattle show held annually in Paris.

CATTLE

1059 - **The Results yielded in 1912 by the Pasture for Young Cattle at Laineck, near Bayreuth, Bavaria.** — Lex in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 27, pp. 327-328. Hanover, July 4, 1913.

The Laineck pasture belonging to the Herdbook Society of the Bayreuth red and white breed (Simmenthal type), has an area of 117 ¾ acres; it is divided into eight enclosures, and in 1912 it supported 126 head of cattle varying in age from 7 ½ months to 2 years and 7 months. The grazing season began on May 7 and ended on October 9. The grazing dues amounted to 36*s* 3*d* for cattle under 20 months of age, and 41*s* for those above this age. In addition to the cattle, the pasture supported about 20 foals, and also yielded a little hay and aftermath. The cattle and foals remained day and night in the open, and were only housed in the sheds during the cold September nights. No extra food was given. The health of the animals was good. The cattle were weighed before being driven up, as well as every four weeks during their stay, and two days before leaving the pasture. They were also measured at the beginning and end of the grazing season. The results obtained were as



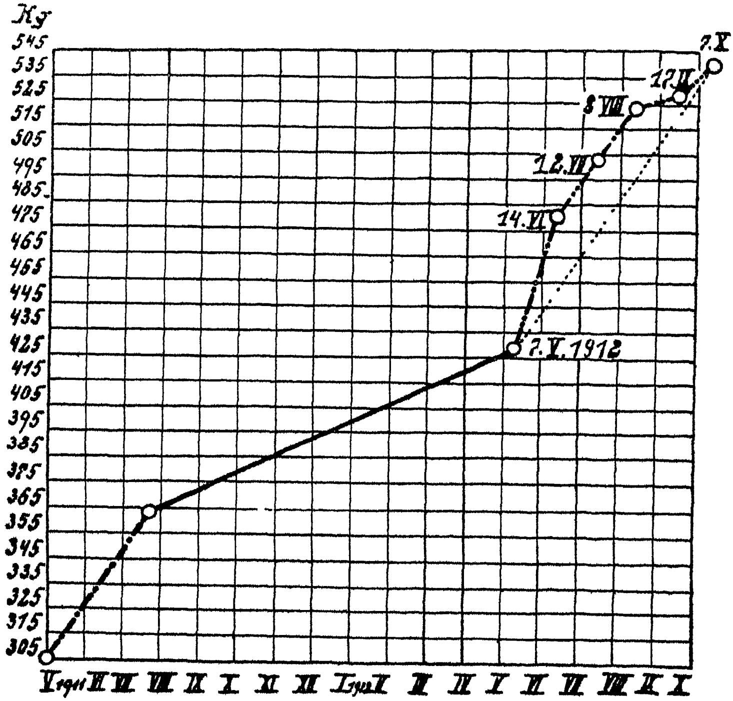


Fig. 1. — Increase in weight of cattle grazed for one season.

Fig. 2 — Increase in weight o cattle grazed for two seasons.

Explanation of fig. 2.

— · — · — · — Increase in weight during the 1911 grazing season.

———————— Increase in weight during stall-feeding in winter 1911-12.

—— · · —— · · —— Increase in weight during the 1912 grazing season.

follows: 19 per cent. of the cattle attained an increase in weight of over 220 lbs. (maximum 295 lbs.). A young animal, 15 months old and weighing 273 lbs., increased 56 per cent. in weight. The average increase was 24.5 per cent. The average daily increase in weight was 1.18 lb. The total increase in weight was 23 000 lbs., giving 182.5 lbs. per head.

Only in the case of 15 animals was the increase below 110 lbs. The accompanying diagrams show the increase in weight of the animals.

The increase in the withers height was:

cm.	1	2	3	4	5	6	7	8	9	10	11
number	2	15	7	19	25	16	14	16	4	2	1

The chest depth increased:

cm.	1	2	3	4	5	6	7	8	9	10
number	2	4	5	10	26	27	20	9	16	5

Increase in girth (chest):

cm.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
number	1	3	1	3	1	4	4	6	5	7	5	9	6	7	9	5	11	5	1	9	7	3	3	0	1	2	3

1060 – **An Illinois Sheep-Feeding Test.** – COFFEY, W. C in *The Breeder's Gazette*, Vol. LXIII, No. 17, pp. 1004-1005, Chicago, April 1913.

The Illinois Experiment Station has recently closed an 84-day feeding test with Western yearling wethers. The object was to determine the value of different roughages for fattening sheep. Eight lots of fifteen sheep each received rations as follows: Lot 1. Shelled corn (maize) and alfalfa. Lot 2. Shelled corn and alfalfa, corn silage. Lot 3. Shelled corn, corn stover and corn silage. Lot 4. Shelled corn, corn stover and linseed oilmeal. Lot 5. Shelled corn and corn stover. Lot 6. Shelled corn, oat straw and corn silage. Lot 7. Shelled corn, oat straw and linseed oilmeal. Lot 8. Shelled corn and oat straw.

For making gains, the lot receiving shelled corn and alfalfa and the one receiving shelled corn, alfalfa and silage were superior to any others, but these gains were made at a cost per pound exceeding that of any other lots, except those receiving corn, oilmeal and oat straw, and corn and oat straw. Corn and oat straw made a very poor ration; at the end of the feeding period, the animals receiving this ration were for the most part inferior in market condition.

The adding of linseed oilmeal did not pay.

Silage added to the shelled corn and oat straw ration gave a market finish practically equal to that where alfalfa was used.

Oat straw supplemented with silage made a slightly better combination than corn stover and silage both in extent and cost of gains. To the feeder with a silo this has a practical significance, as oat straw is more convenient to handle, and corn stover requires a large amount of labour in cutting up.

However, when silage is not available, corn stover is a better roughage to use with shelled corn than oat straw. Corn stover and silage were far superior to corn stover alone.

The results show that silage is a valuable ration in fattening sheep and lambs when judiciously fed. In no case was it fed in large quantities, or the reason that it was not possible to get the sheep to consume a flarge amount of it.

PIGS

1061 - **Irish Pig-Feeding Experiments.** - SPENCER, SANDERS in *The Farmer and Stock-Breeder*, Vol. XXVI, No. 1234, p 1012 London, May 19, 1913.

The first reported experiment was said to be entered upon to ascertain whether pigs could be profitably fattened wirthout potatoes. The six pigs used for the experiments were divided into two lots of three each. The first lot were fed on equal parts of Indian meal and pollard for 122 days; the second lot were fed on potatoes and on equal portions of Indian meal and pollard. The increase in weight of the two groups was nearly the same, but was a little superior in the case of the first. Calculating the price fetched by the animals and the cost of their food, it appears that, as the average price of marketable potatoes in Ireland is more than £2 per ton, a mixture of Indian meal and pollard costing 8s. per cwt. would generally be a more profitable pig-fattening food than a mixture of the three foods named. The experiment gives no conclusive data, as no mention is made of the percentage of dead to live weight, or of the quality of the meat.

The second experiment was carried out for the purpose of comparing the values of barley meal and maize in the fattening of pigs. In this case also six pigs divided into two lots of three were used. The experiment lasted 76 days. The first lot were given maize, potatoes and skim-milk; the second lot receveid barley meal and a similar addition of potatoes and skim-milk. The pigs in lot 1. appear to have made a greater increase by 7 lbs. each than the barley-fed lot, but this small variation does not seem to have influenced the reporter greatly, since it is recorded that "the difference in the results from the two foods was so slight that it may be assumed that berley meal is as satisfactory a food for pigs as Indian meal, and it possesses the advantage that it can be produced on the farm".

Similar experiments having the same objects in view were carried out in Co. Cork, but the details given are fuller, and the number of pigs greater.

In the first of the two experiments, eight pigs were utilised; they were cross-bred Large Yorkshire pigs, presumably the offspring of a boar of this breed out of locally bred sows. The eight pigs were divided into two lots of four animals each. From November 12 to the beginning of February the first lot was fed on potatoes, barley and separated milk, while the second received potatoes, maize and separated milk.

The total increase in weight in the two lots was about the same, while the proportion of dead weight to live weight was 74 per cent. in the case of the first lot, and 75.4 per cent. in that of the second.

A second experiment was carried out, also with eight pigs; no separated milk was given, the animals being fed in the first case on potatoes and maize meal and in the second on potatoes and barley meal.

The daily increase of weight was larger in the pigs given barley meal. The animals showed a decided preference for the latter and would have consumed larger quantities of it than of maize meal. The subsequent examination of the meat showed that, as a rule, the flesh of barley-fed pigs is firmer and of better quality than the meat from pigs fattened on maize. Mention is also made of the fact that some of the pigs fed on maize meal suffered from so-called cramp (1), whilst those fed on barley meal were unaffected.

GOATS

1062 – **Tests of the Performance of Goats belonging to the Goat-Breeding Associations of Brüggen, Harsum, Schüttorf and Wessenstedt, Hanover.** VIETH in *Zeitschrift für Ziegenzucht*, No. 9, pp 130-133; No. 10, pp. 149-151; No. 13, pp 200-203; No. 14, pp. 213-217. Hanover, May and July 1913.

These milking tests were begun in March 1911 and carried on with the assistance of the Prussian Ministry of Agriculture, Domains and Forests (Preussische Ministerium für Landwirtschaft, Domänen und Forsten). The number of goats tested was 10 for each Association. The first milking test was made 7 days after the kids were dropped, the others every 14 days until only half the goats were still milking. Three goats of each Association were milked three times a day, the rest three times at first, subsequently only twice. The Wessenstedt goats were all milked three times at first, and afterwards twice.

The yields of milk and of fat were determined. For the milk, the volume was determined and the specific gravity of 1.032 taken as a basis for the calculation of the weight. The butter yield was estimated by multiplying the fat content by 1.1.

The total results of the milking tests are given in table I.

TABLE I.

Breeding society	Breed	Number of times the animals had kidded	Length of observations days			Yield of milk lbs.			Fat content %			Butter yield: lbs.		
			Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
Brüggen	Harz, fawn-coloured, hornless	2-10	280	308	291	1180.7	2031.0	1612.6	2.97	5.28	3.90	53.38	91.79	68.48
Harsum.		2- 7	255	315	296	1357.4	2501.2	1977.8	2.98	4.78	3.63	51.81	101.10	78.38
Schüttorf	Saane, white	3- 8	238	294	266	932.1	1580.0	1199.0	2.32	4.07	3.17	31.91	49.94	41.18
Wessenstedt. . .		2- 8	224	294	272	1324.0	2147.9	1712.0	3.11	4.36	3.54	52.86	81.61	66.30

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(1) In the countries of Southern Europe, where maize is fed on a large scale, it does not appear that this disease is of especially frequent occurrence.

(*Ed.*).

These data show that the highest yields were furnished by an Association keeping Harz goats, and the lowest by an Association breeding Saane goats. On the other hand, if the total results are taken into account, it is clear that the Harz goats cannot be assigned a higher place than the Saane breed.

Table II gives the average milk and fat yield of the goats which were milked three times a day.

TABLE II

Number of goats	Average milk yield lbs			Average fat content %		
	morning	noon	evening	morning	noon	evening
12	3.21	1.82	2.16	3.22	4.28	[illegible].64

As regards goats which were milked thrice daily, the decline in yield which occurred between the first and second series of observations, was in the proportion of 100: 82 in the case of milk, and of 100: 78 in that of fat.

In the case of the Wessenstedt Association goats, which were milked regularly thrice during the course of the first observations, and twice only during that of the second, the decrease in the yield of milk and fatty matter was in the proportion of 100: 85.

Table III gives the average production of milk and fatty matter on the different test days.

TABLE III

Test day	Milk lbs	Fat %	Test day	Milk lbs	Fat %	Test day	Milk lbs	Fat %
1	7.3	4.906	8	7.0	3.481	15	4.4	4.217
2	7.9	3.962	9	6.6	3.441	16	4.2	4.051
3	7.7	3.578	10	6.2	3.204	17	3.7	4.233
4	7.9	3.549	11	5.9	3.333	18	3.3	4.394
5	7.9	3.403	12	5.7	3.427	19	3.1	4.450
6	7.5	3.525	13	5.3	3.771	20	2.6	4.989
7	7.3	3.672	14	4.9	4.023	21	1.8	5.040

In order to definitely decide whether, and in what manner, the age of the goats, and therefore the number of times they had kidded, influenced the yields, the experimental animals were divided into three classes. In the first were placed the goats which were in their second or third lactation period, in the second those in their fourth or fifth, and in the third all those animals which were in their sixth or further period of lactation. It was found that the average results were about the same for all three classes. It thus appears, that there is little difference between the milk yield of younger and older goats.

The test showed that the capacity of goats for milk production is an individual property; that these animals are able to utilise to a high degree the food they consume, and that, in their case, there is no determined relation between the amount of milk produced and its fat content.

POULTRY

1063 - **Ostrich Farming in America.** — NIELSEN, N. (Report presented to the Government of New South Wales) in *The Agricultural Gazette of New South Wales*, Vol. XXIV, Part 5, pp. 397-401. Sydney, May 2, 1913.

Ostrich farming in the United States is confined to Arizona, Southern California and portions of Texas and New Mexico, for the birds are very sensitive to cold and these are the only regions in the States which possess a sufficiently warm and dry climate all the year round.

In California the farms situated near the large cities such as Los Angeles and Pasedena are used almost as much for show places as for the production of feathers and derive a large portion of their income in that way. Under these circumstances the area of the farms is necessarily somewhat restricted and the birds have to be fed artificially. In Arizona, on the other hand, large tracts of land formerly used as cattle ranches have been turned into ostrich farms where feather production is the sole object, and where the birds are kept under the most natural conditions possible and in enormous colonies up to 5 000 head on one farm. The land is divided up into main "run paddocks" or enclosures, and smaller feeding paddocks. The former are large, varying from 90 to 180 acres in extent; to each are attached 5 or 6 feeding paddocks varying from 6 to 10 acres each according to the size of the adjoining run paddock, and making up together a total area equal to one third of that of the run paddock. The feeding paddocks all run alongside the main irrigation ditch of the property in order to have an available water supply both for the use of the birds and for irrigation purposes; they are sown with leguminous crops or cereals, commonly used in order to provide green food all the year round, and the birds are only allowed into one or two at the time. Run paddocks are sown with some hardy perennial grass and rarely irrigated, but if watered, these, as well as the feeding paddocks, are allowed to dry well before the birds are turned on again.

The greater number of birds in the Arizona farms are of South African stock and type, but it has been recently denonstrated that an infusion of Nubian or Red-necked blood has increased not only the phys-

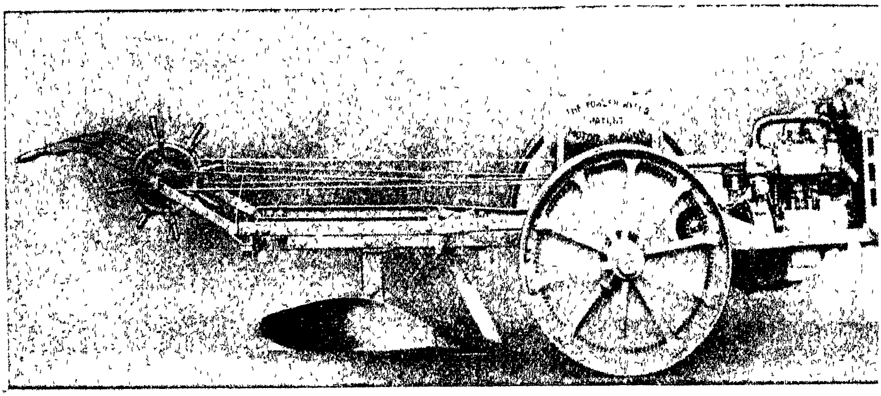

Fig. 1.
Fowler-Wyles motor plough.

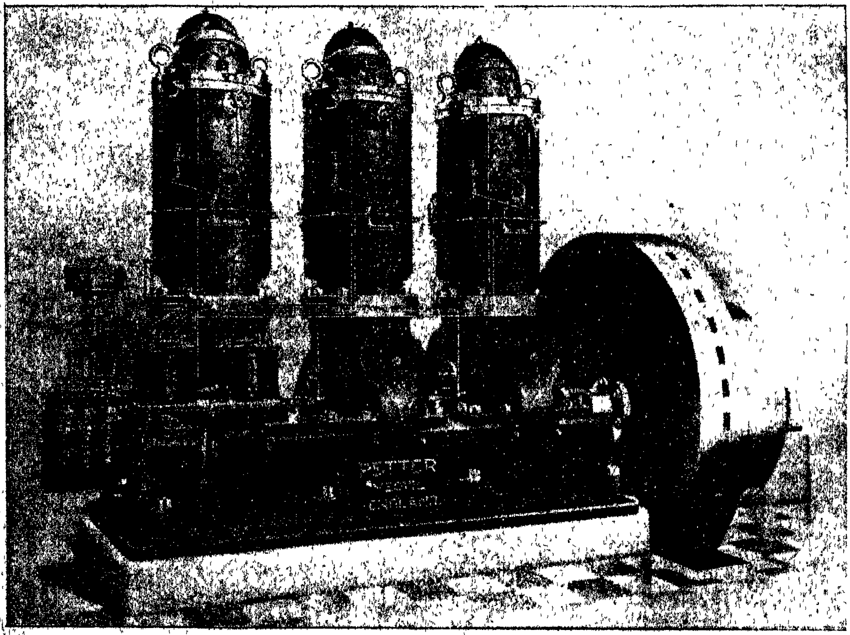

Fig. 2.
Pitter's semi-Diesel engine.

ical stamina of the birds, but also their capacity for producing valuable feathers. All plucked feathers are roughly sorted on the farms by girls; they are then tied up in bundles weighing from half a pound to one pound and sent to New York, where they are dressed for the market

As a result of his observations the writer was led to believe that large tracts of land in New South Wale would be eminently well adapted to the requirements of this industry

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS

1064 – **Engines and Agricultural Apparatus Exhibited at the Show of the Royal Agricultural Society held at Bristol, 1913** – *Engineering*, Vol 96, Nos 2480, pp 18-22 and 40-44. London, July 4 and 11, 1913 – *The Engineer*, Vol 116, Nos 3001 and 3002, pp 10-12 and 37-40 London, July 4 and 11, 1913 – *The Implement and Machinery Review*, Vol 39, No 460, pp 505-551 London, Aug. 1, 1913

These three accounts contain detailed descriptions and figures of some of the exhibited agricultural machines which showed various innovations and improvements in their construction

Especially worthy of note are the motor ploughs and traction engines of the following firms: Messrs. John Fowler and Co; The International Harvester Company of Great Britain; Messrs. Aveling and Porter; Darly-Marshall Motor Plough Syndicate, Messrs. Marshall Sons and Co; Messrs W. Forster and Co., and The Ideal Agricultural Motor Company.

Fig 1 represents the newest type of the Fowler-Wyles motor-plough with a one-cylinder paraffin or petroleum motor. Fig. 2 shows a Petter 3-cylinder 150 H. P., Semi-Diesel engine.

Messrs. Davey Paxman and Co. exhibited gas engines. Oil motors were shown by Messrs. Brazil, Straker and Co.

Many milk separators and machines for food preparation were on view. Prizes were awarded for milking machines and sprayers The first prize for the former was given to the "Amo" machine constructed by the Aktie-bolaget Mjolkningmaskin Omega, Flen (Sweden). The second was given to the milking machine of Vaccar Limited, London. Both these machines are Swedish inventions. The "Amo" is a suction machine. The tin vessel holding the milk is hung over the cow's back on an adjustable web band. It is to be noticed that the milk passes into the milk vessel through four celluloid, and not indiarubber, tubes. The milking machine exhibited by Vaccar Limited is worked by a pulsator.

Among the sprayers, the first prize fell to the "Green" powder sprayer of Messrs. Moellenkamp and Co., London, and the second to the "Pilter" powder sprinkler of Messrs. Pilter and Co., London.

1065 - **The Machines and Implements at the Exhibition of the German Agricultural Society at Strassburg, 1913.** - 1. KÜHNE, G. in *Maschinen-Zeitung*, Year 11, Nos. 13 and 14, pp. 153-161 and 166-172. - 2. PITTINS, F. *Ibid.*, No. 15, pp. 178-183. Berlin, July 1 and 15 and August 1, 1913. - 3. *Landwirtschaftliche Maschinen und Geräte*, Year 13, Nos. 22 and 23, pp. 15-35 and 15-23. Artern, May 31 and June 7, 1913.

The exhibition catalogue contained nearly 8000 exhibits, exclusive of those shown in the pavilions set apart for the chief and the preliminary trials (1). The number of exhibits being large, only some novelties are mentioned in this account. A turn-wrest plough with a new device for easy adjustment of the head, was exhibited by the plough maker I. G. Dobler of Landsberg. The Finnish firm of G. Svanljüng exhibited a new model of their harrow with rotating teeth (Rollspatenegge).

The ploughing machines were the centre of great interest, and were very numerous in view of the chief trial organised by the German Agricultural Society for motor ploughs during the current year. In order to facilitate inspection, these machines were divided into three groups according to their method of work, and regardless of the fuel used:

1. Mechanical ploughs on the winding drum principle.
2. Mechanical ploughs with direct traction.
3. Picking machines (Bodenfräsmaschinen).

The first group consisted of the steam ploughs of the firms A. Ventzki A. G. of Grandenz, John Fowler and Co. of Magdeburg, the Heilbronn Machine Manufacturing Co., and a plough drawn by a cable driven by an explosion motor, shown by the firm of F. Kners of Tegel. No electric outfits were exhibited.

A compound steam ploughing engine driven by super-heated steam with a boiler of a new construction was shown by the firm A. Ventzki A. G.; this machine, though it is rated by its constructors at 90 H. P. and can for a time attain 130 H. P., only weighs 13 tons. The decreased weight will facilitate the management of the machine. Its price is £ 1000. The same firm exhibited a steam balance plough with a subsoiler of a new type. Messrs. F. Kners of Tegel showed a mechanical plough worked on the two-engine system; these engines have four heavy wheels, can reverse, and have four cable speeds. The length of the cable is 1500 ft. The amount of benzol used in normal work is, according to the makers, 9 oz. per horse-power hour. The ploughing-tackle weighs 16½ tons and the total price is £ 1075.

The tractor ploughs were more numerous. In this class are included those machines in which the motor and the body of the plough are mounted on the same framework and those in which the plough is dragged by a separate tractor.

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(1) The machine trials organised by the German Agricultural Society on the occasion of these exhibitions fall into two classes, the chief and the preliminary trials (Haupt-und Vorprüfungen), of the new machines. The latter are placed in special pavilions called trial pavilions. (*Ed*).

A Stock motor plough in the chief trial pavilion showed many improvements upon the earlier types. Other motor ploughs exhibited were of the Wendeler-Dohrn type and those of the International Harvester Co. (Berlin) and the Holt Caterpillar Co. (Budapest).

The "Akra" plough of the "Aktien Maschinen-fabrik Kyffhäuserhütte" is of the Stock type but larger. The four-cylinder benzol motor has a stroke of 8 in., a cylinder diameter of 6 in., and a maximum force of 85 H. P. at 750 revolutions per minute. Its weight is 6 tons and its price £ 1000. A new liquid-fuel motor, used for the traction of ploughs or heavy loads, was exhibited by Messrs. John Fowler and Co. of Magdeburg. The weight of this is 9 tons and its catalogue price £ 1040.

The picking machines were represented by the exhibits of Messrs. Lang of Mannheim; the "Studiengesellschaft für Landbaumotoren" (Munich) and the "Siemens-Schuckert" Werke (Berlin). The "Lanz" machine of the Köszegi type is constructed on a new system. The four-cylinder benzine motor gives 60-70 H. P. with about 580 revolutions per minute. The "Factotum" machine of the Munich "Studiengesellschaft für Landbaumotoren" has a new type of roller. The latter carries 6 rows of pickers, which are not rigid, as in the case of the Lanz-Köszegi plough, but can revolve round a point. The price of this machine is £1250, nearly the same as that of the "Lanz" machine. The trials made with two Meyenburg system ploughs which were also exhibited proved very interesting. The smaller weighs 15 cwt.; it has a 10-12 H. P. motor and costs £250. The larger is of 25 H. P.

Amongst the other exhibits were numerous manure-distributors, charlock sprayers, thrashing machines and dairy machines and utensils.

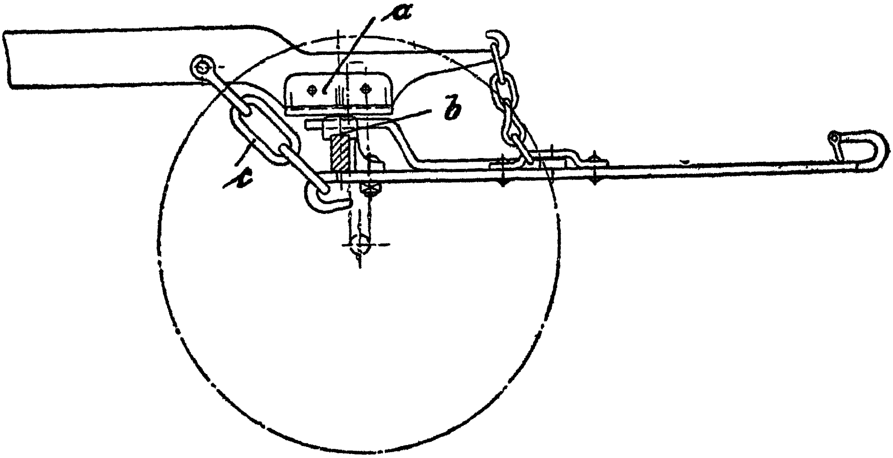
1066 - **Trial of a New Self-guiding Two-Wheel Plough with Subsoiler.** (Fortieth Report of the Machine-Testing Department of the Brandenburg Provincial Chamber of Agriculture) — FISCHER, G in. *Mitteilungen des Verbandes landwirtschaftl. Maschinen-Prüfungs-Anstalten*, Year 7, Part 2, pp. 18-55. Berlin, 1913

The plough described in this report was used on the estate of Dahlem near Berlin, on the Hellersdorf estate belonging to the city of Berlin, and on the Uetz estate (Osthavelland). During the time that this plough was used (1911-1912), the Department for Machine Testing had the opportunity of testing it more than once.

The new wheel-plough is chiefly characterized by a new appliance for self-guidance (see figure). The beam rests by means of a cast-steel plate (*a*) upon the saddle (*b*) of the axis of the fore-carriage to which it is attached by a short chain (*c*). The construction is such that the supporting plate, under the influence of the different degrees of resistance offered by the soil, can rise on the round saddle, while the chain placed beneath the beam obliges the latter to resume its former position. The speciality of the new plough is the simplicity of its construction. Another point in which it differs from ordinary wheel-ploughs is that a spring subsoiler is attached to the beam to break up the bottom of the open furrow. The mould-board of the plough must naturally be adapted to the soil conditions; that used during the trials was suitable to a moderately compact soil. The mould-board is made of soft steel. The wheels of the fore-carriage have replaceable boxes on the nave.

This new plough, of which eight have been made, costs, including coulter and reserve share, from £2.2s to £4.10s. Skim-coulter and subsoiler are reckoned separately; the first, with spare share, costs from 6s to 8 s 6 d according to the size of the plough; the price of the second, including the attachment, is from 10 s to 28 s.

As a result of the tests and a prolonged trial on the three above-mentioned estates, it may be said that the plough worked excellently, and when the right-sized machine was selected, it fulfilled all the demands made upon it. Particularly noticeable is the simplicity of its construction, the facility with which it is managed and guided, and also the fact that this plough also serves the purpose of breaking up the subsoil. Wheel-ploughs of this type have only been in existence a few years. In the new plough the subsoil share is narrow, as, in the opinion of the constructor, this type requires a minimum of traction force and has a better influence upon plant growth than a broad one. The truth of this statement is being tested in different places, but the experiments, which will extend over many years, are not yet finished.



Their results are, however, only of secondary importance as regards the judgment to be passed on the plough, for the advantageous nature of breaking up the subsoil has long since been demonstrated in many ways. As the transformation of the plough in to a subsoiler only costs a few shillings, and the machine works equally well in both capacities, its technical perfection is already worthy of recognition.

1067 -- **Reinforced Concrete Rollers for Use on Moorland Soil** (1) SIEGERT in *Der Kulturtechniker*, Year 16, No 3, pp 237-239. Breslau, July 1, 1913.

It is well known that rolling the soil has a great influence upon the yield of moorland crops and is especially important in laying down meadows and pastures. Unfortunately, rolling is too little practised and is sometimes entirely omitted. The reason for this is, almost invariably, the high price of an iron meadow roller. It is thus well to draw the attention of the agriculturists to rollers made of reinforced concrete, which they can construct themselves on the spot, selecting the weight most suitable for their purpose.

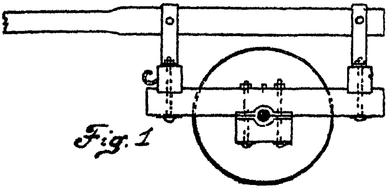


Fig. 1

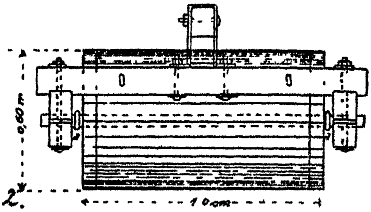


Fig. 2

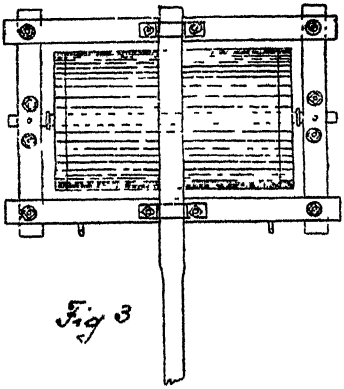


Fig. 3

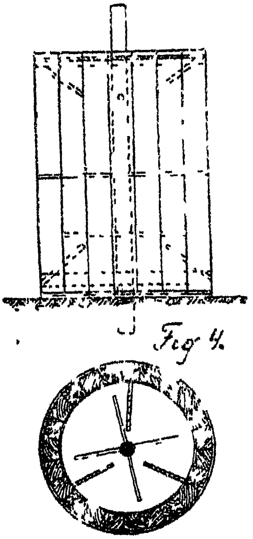


Fig. 4

Figs. 1-3 give such a roller in side and front elevations and plan. A roller of this kind 3 ft. 3 in. wide weighs, without the iron parts and

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1913. (*Ed.*).

shafts 1230 lbs. for a diameter of 24 in., 1700 lbs. for a diameter of 28 in., 2200 lbs. for a diameter of 32 in., and 2800 lbs. for a diameter of 36 in.

Construction of the mould and of the roller. — A circular piece of wood of the diameter of the roller is placed level on the ground. Through the centre is passed the axle, which must project 8 in, at each end beyond the cylinder of reinforced concrete. It may consist of an old cart axle, or of a cylindrical bar of iron, of 2-inch diameter. In order to ensure the adhesion of the cement to the axle, and to prevent the latter turning independently of the roller, it is transfixed, 16 inches from each extremity, by rods of iron which project perpendicularly; the middle of the axle is also notched. On the circle of wood an iron hoop of the same diameter as the roller is placed. This hoop protects the edge of the latter; it is furnished internally with three twisted bands of flat iron penetrating obliquely into the mass of concrete. Vertical lathes are now nailed all round the wooden bottom, or else are bound round it with wire. On the upper portion of the cylinder formed by the lathes, there is placed inside a second iron hoop similar to the first and 3 ft. 3 in. from it; this is fixed to the lathes by iron wire so that it cannot shift. After the axle has been centered exactly, the mould (fig. 4) thus prepared is ready for filling in the concrete. The concrete should be made with as little water as possible, using 1 part of cement to 3 or 4 parts of washed gravel.

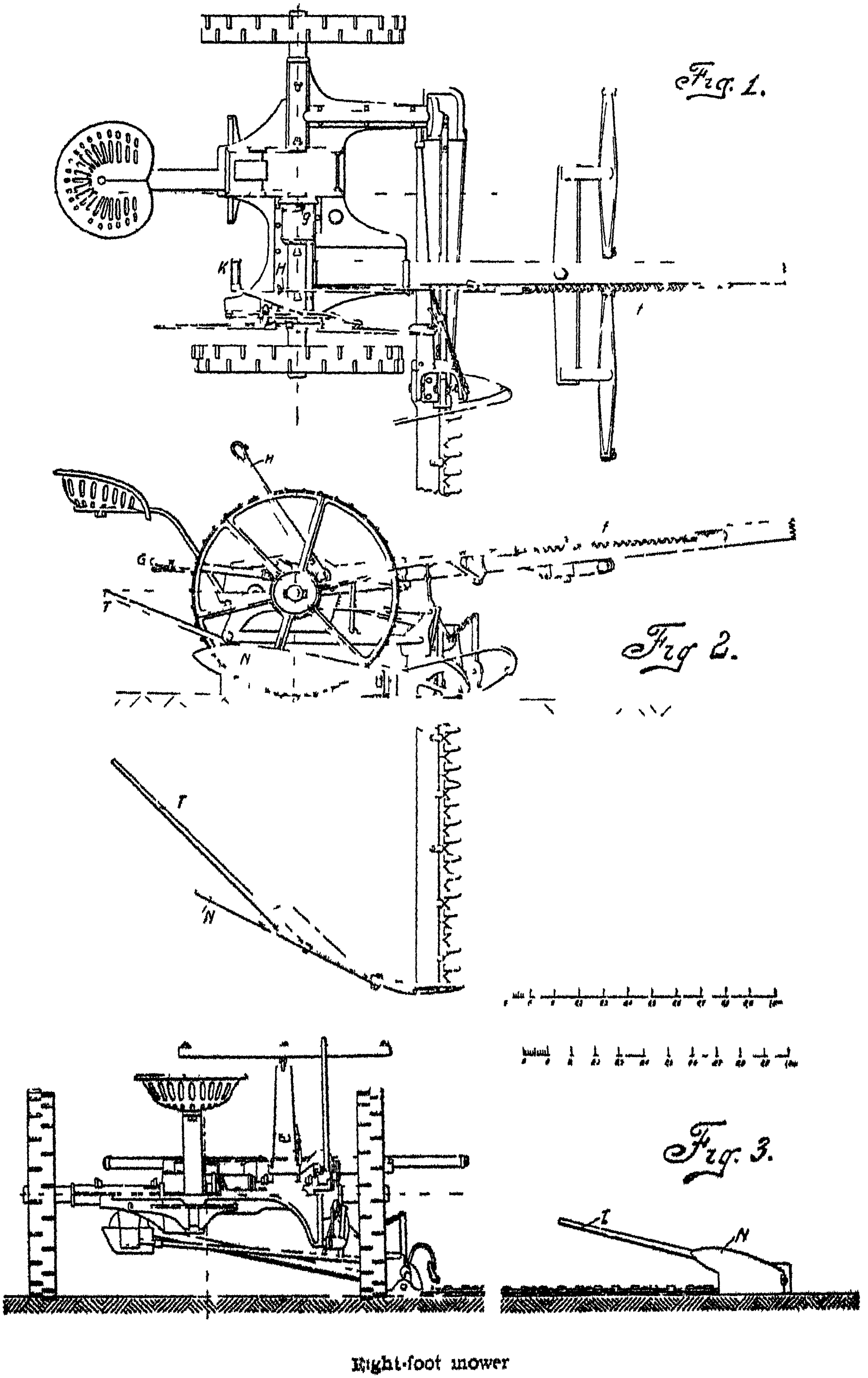
The concrete must be rammed in in layers of about 8 inches, and the ramming of each layer should go on till water appears on the surface. The mould being thus filled, it is left in the shade for two or three weeks, care being taken to water it frequently. At the end of this time, the wires and lathes are removed, the surface is smoothed over with cement, and subsequently the concrete roller is laid on its side. Then follows the construction of the deal frame, shown in figs. 1-3.

A roller of 24 inch diameter and 3 ft. 3 in. long costs, when made on the spot, £3 15 s. A long roller is unsuitable for moorland soil, owing to difficulty in turning.

1068 – **Trial of an Eight-Foot Grass-Mower.** — NACHTWEH, A. (Ninth Report of the Testing-Station for Agricultural Implements and Machines, at Hanover) in *Mitteilungen des Verbandes Landwirtschaftl. Maschinen-Prufungs-Anstalten*, Year 7, Part 2, pp. 71-83. Berlin, 1913.

In fig. 1 the grass-mower is represented as seen from above, and [illegible] fig. 2 the side view is given; the drawings are to scale. *H* is the le wich raises the carrier of the finger-bar, which is released by the sp spring *f*. The lever, *G*, serves to fold back the mowing appara upon itself, while *K* represents a foot-lever which can be used simultaneously for the same purpose. The finger-bar is 8 ft. long and has 31 fingers in 10 sections.

In fig. 3 the mower is drawn as seen from behind; this shows in particular the shoe *N*, at the end of the finger-bar; by means of a prolongation, *I*, the shoe can easily be taken hold of to help in raising the finger-bar.



Eight-foot mower

Owing to its great length, the finger-bar would be apt to bend a little; this is obviated by its being bent slightly upwards in such a manner that when in a horizontal position, it becomes perfectly straight through its own weight. In order to give great stability to the mower, the wheels are placed very far apart and the gear for working the knives is situated between the two wheels.

This machine was tested on the meadow of Empelde near Hanover, and many agriculturists made the first and second cuts with it. They seemed very satisfied with the work of the mower, and were especially impressed by the large amount of work it performed, and its light running. The official trial was made in a field at Empelde belonging to Hr. Fricke, many measurements being taken and dynamometric experiments carried out. Longer tests were effected to decide the two following points.

1. The force expended in traction.
2. The adaptability to slopes.

The results obtained in both cases were excellent. The writer gives tables showing the width of the cutting and the amount of traction force required. The blade was examined as regards its cutting diagrams (Schnittdiagramme) according to the Nachtweh method.

The mower weighs 760 lbs. and costs £22.

The conclusions drawn from the trial are as follows: as a result of the many tests made during the summer of 1912, this machine may be regarded as completely fulfilling all practical requirements; it is very light, possesses great stability and does a large amount of work.

1069 – **Trial of an Automatic Feeder *for* Threshing-Machines.** — NACHTWEH (Tenth Report of the Testing-Station for Agricultural Implements and Machines, at Hanover) in *Mitteilungen des Verbandes landwirtschaftl. Maschinen-Prufungs-Anstalten,* Year 7, Part 2, pp. 83-86. Berlin, 1913.

The trial in question took place on the 5th of April 1913 on the Gehrdts estate at Appensen, near Bevensen. The automatic feeder was fixed to a threshing-machine whose drum was 67 inches in length and 16 $^{3}/_{4}$ inches in diameter. The chief part of the feeder is a toothed revolving shaft; it bears arms carrying at their extremities two angle irons situated somewhat apart from each other. The teeth are fixed alternately on these angle irons and pass though slits in the sheet iron cover, which is supported by two braces. The quantity of sheaves taken up by the toothed rotating shaft is regulated by special fingers.

Owing to the late date only rye and wheat were available for threshing. In a trial with rye, the amount threshed in a quarter of an hour was observed; this was 757 lbs. of grain, which would mean about 38 bushels (of 56 lbs.) per hour. Wheat was then tried; in one hour 45 $^{3}/_{4}$ bushels (of 60 lbs.) were got through. As the guaranteed average output is 25 to 30 bushels per hour, the trial may be considered satisfactory.

The working of the automatic feeder is also excellent. The examining committee was satisfied that the amount of grain threshed was in no way diminished by using it, so that it may be considered altogether satisfactory.

Before a final judgment is pronounced on the thresher and feeder, it is intended to submit them to extensive trials with various cereals this autumn.

1070 - **Drill for Beet Seed.** (German patent No. 251-386) — *Blätter fur Zuckerrubenbau*, Year XX, No 12, pp. 188-189 Berlin, June 30, 1913.

The usual drills for sowing beet seed in clusters are not well adapted for sowing on the ridge, as the clusters frequently fall off the comparatively narrow crest of the ridge into the furrows. For this reason the subject of the present patent is provided with a coulter, in front of the sowing funnel, which traces a flat-bottomed depression along the crest of the ridge, ready for the seed to fall into.

Fig 1.

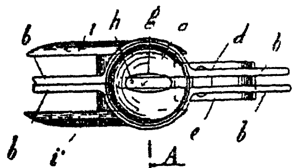


Fig 2.

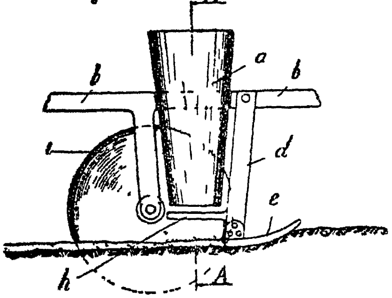


Fig 3.

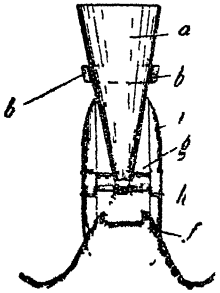
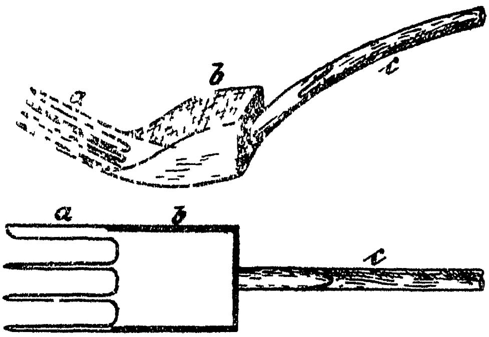


Fig. 2 gives a side view of the apparatus, and figs. 1 and 3 views from above and in front (partly in section). Between the two supports (*bb'*) of the funnel of the distributor (*a*) is the stanchion (*d*) which supports the coulter: this is about 2 inches wide and bent back to give a flat bottom; it leaves a flat-bottomed depression (*f*, fig. 3) into which the seeds fall.

The distributor (*h*) is situated below an oval opening (*g*) in the bottom of the funnel, and is supported by the stanchion (*d*). To prevent the seeds getting too much scattered, or carried away by the wind, two revolving discs (*i i'*) may be fixed on, one on either side of the funnel.

1071 – **Combined Fork and Shovel.** — De Conde, G. in *Journal d'Agriculture pratique*, Year 77, Vol II, No. 28, p 57. Paris, July 10, 1913.

The handling of litter of very short material with a fork is an awkward job: this is so with very short straw, peatmoss, sawdust, leaves, weeds, etc. On the other hand, the wooden shovel used for sawdust will not do for other material used to replace straw as bedding.



These difficulties are done away with by using the combined fork and shovel shown in the figure. This tool, which is easily made, is a four-pronged fork, with the right hand prong (*a*) generally wider than the others. The back part is solid and forms a shovel (*b*) with a handle (*c*). The length of the prongs may be varied.

1072 – **Trial of the Lawrence-Kennedy-Gillies Milking Machine at the Live Stock Institute at Reggio Emilia (Italy).** — Cugnini, A. in *L'industria lattiera e zootecnica*, Year XI, Nos. 8-13, pp. 132, 152-153, 168-169, 185 and 200-203. Reggio-Emilia, April 15, May 3 and 19, June 1 and 15 and July 15, 1913.

The trial of the above machine was carried out in 1912 under directions from the Ministry of Agriculture. The writer first gives an outline of the development and working of mechanical milking apparatus. The machines belong to two groups, milking respectively by suction and by pressure: the former imitate the action of the calf's tongue in sucking, the latter the action of the milker's hand. The principle machines of the first group, which include a suction-pump worked by a motor of about 2 H.P., are:

Lawrence-Kennedy-Gillies.
Burrell-Lawrence-Kennedy.
Max.
Wallace (1).
Dana.
Thistle.

Those of the second group, in which pressing parts do the work, are:

Alfa-Dalen
Loquist.
Sans-Rivale.
Galakton (2) (3).

The trials, made on ten cows divided into two lots of five, were intended to examine the following points:

1. Fixing and working of the machine.
2. Influence of mechanical milking on the health of the animals.
3. Completeness of the action.
4. Quality and quantity of the milk.
5. Time required for milking and manual labour involved.
6. Cost of installing the machine.
7. Hygienic qualities of the milk.

Besides these two lots, which were used specially to determine the effect of mechanical milking on the quantity and quality of the milk, some other cows were machine-milked.

The experiments were divided into a preliminary period of 30 days, to fix the rations, the weight of the animals and the milk-yield, and an observation period of four months, in which the cows of lot I were machine-milked and those of lot II hand-milked as control.

The writer gives details as to the rations, and then turns to the working and manipulation of the machine.

The apparatus is accurately and strongly constructed; during the whole trial period none of the metal parts got out of order, and the only parts requiring renewing were some of the rubber tubes. The handling of the apparatus is very simple. With regard to the health of the cows, there was nothing unusual to report.

The completeness of the milking has a marked influence on the quality and quantity of the milk, as well as on the occurrence of affections of the udder. Tables given by the writer show the details of this. It appears that between the 1st of July and the 15th of October the total amount of milk drawn by the machine was 9 967.5 lbs., while the amount milked by hand to complete its work was 766.1 lbs. or 7.14 per cent. of the total yield. The data on the quantity and quality of the milk are also given in a table. In the preliminary period the yield of the two lots per head per day was almost equal, namely 27.90 and 27.24 lbs. In the experimental period the average yield of lot I was 20.98 lbs., as compared with 19.93 lbs. for lot II. The time taken to milk each cow was 15 minutes with the machine, as against 8 minutes by hand.

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(1) See. No. 170, *B.* Feb. 1913. *(Ed.).*

(2) See No. 169, *B.* Feb. 1913. *(Ed.).*

(3) Further information on these milking machines, as well as on the " Revalo ", " Bergner Revalo ", " Andersen-Schmidt ", " Delta ", etc., may be found in the following publications: *L'Industria lattiera e zootecnica,* No 17, 1912; NELLO FOTTICCHIA " La mungitura meccanica ", *Ibid.* 1909-10; *Deutsche Landwirtschaftliche Presse,* 1909, 1911, 1912; *La Vie agricole et rurale,* 1912; *Journal d'agriculture pratique,* 1910, 1911, 1912; *Bulletin de la Société des agriculteurs de France,* 1912. *(Author's note).*

The following table shows the cost of installations:

For	60- 80	cows,	with 3	pulsators	. . . . . .	£ 120
»	80-100	»	» 4	»	. . . . . .	» 150
»	100-130	»	» 5	»	. . . . . .	» 175
»	130-160	»	» 6	»	. . . . . .	» 225
»	160-180	»	» 7	»	. . . . . .	» 255
»	180-200	»	» 8	»	. . . . . .	» 290

After treating at length of the milk, the writer sums up his conclusions as follows.

1. The working of the apparatus presents no difficulty, and its manipulation is easy.
2. Almost all cows allow themselves to be milked without difficulty from the first; only a few need a short time to get accustomed to the method.
3. The milking machine in question had no deleterious action on the general health of the cows; two of them showed slight hardening of the hind quarters of the udder, but this soon went off.
4. The apparatus did not milk dry, and hand stripping was necessary in every case.
5. Machine milking, supplemented by hand stripping, had no appreciable depressing influence on either the quantity or the quality of the milk.
6. For all the cows, machine milking was slower than hand milking.
7. It appears that on large dairy farms the number of milkers can be reduced by using several of these machines; but the total number of hands required seems hardly to be lessened.
8. The expenses incurred in machine milking are certainly not lower than with hand milking.
9. To obtain proper hygienic conditions in the milking, scrupulous cleanliness in the apparatus is essential.

1073 – **Milking Machines: Effect of Machine Method of Milking upon the Milk Flow.** — SMITH, G. A. and HARDING, H. A. — *New York Agricultural Experiment Station, Bulletin* No 353, pp. 327-361. Geneva, N. Y., November 1912.

The Burrell-Lawrence-Kennedy milking machine has been in use at the New York Experiment Station since 1907 and has been continuously tested against hand milkers by dividing the herd as far as possible into two equally productive halves, and subjecting each cow alternately to hand and to machine milking during her successive lactation periods. The milk flow is subject to so many fluctuations that the results cannot be taken as in any way conclusive, but so far as they go they do not indicate any depressing effect on the yield by the use of the machines, and two cows, one small teated and the other very hard milking, which could not be milked by hand, gave satisfactory returns with the machine. It was calculated that one man with two machines could attend to 15 cows.

1074 – **Improved Universal Desiccator for Drying Potato Slices, Beet Leaves, Cereals, Beet Seeds, etc.** – Voss, II. in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 55, pp. 672-673. Berlin, July 9, 1913.

With the present desiccators, not only potatoes, mangolds, cereals, beet-seeds and peas can be successfully dried, but also beet leaves, potato haulm, etc.

The best and most extensively used are the drum desiccators with rotatory mechanism in which hot gases straight from the generators can be used for drying.

The drum desiccator of the "Tätosin" system, thanks to the removable revolving apparatus in the interior of the drum, can be employed for drying every kind of agricultural and industrial product, provided that the latter is suitably prepared. The apparatus (figs. 1 and 2) consist of a revolving cylinder, in which perforated cups (A) are placed one above another. These cups possess movable perforated lids (B) through which the substances to be dried find their way from the outer zone to the middle of the drum and back. This is of great advantage in ensuring equal drying and permitting the utilization of the hottest gas given off by the generators.

Product	Fuel used	Temperature of the gases on entering C.	Temperature of the gases on leaving C.	Speed of hot air in the drum in ft. per second
1. Potatoes with 18 % starch	Coke only	550	200	3.3 – 3.6
2. Beet leaves reduced to one-fifth of their weight when dry	Coke and anthracite	580	180	1.65 – 1.95
3. Cereals (decrease of humidity 5 %)	»	180	40 – 45	1.0 – 1.15
4. Beet and other seeds . .	»	170	35 – 38	0.9 – 1.0
5. Beet slices	»	520	180	3.3 – 3.6

Numerous experiments have been made for the purpose of determining the best temperatures and speeds of the hot air in the case of different products; the results are given in the table.

Fig. 1.

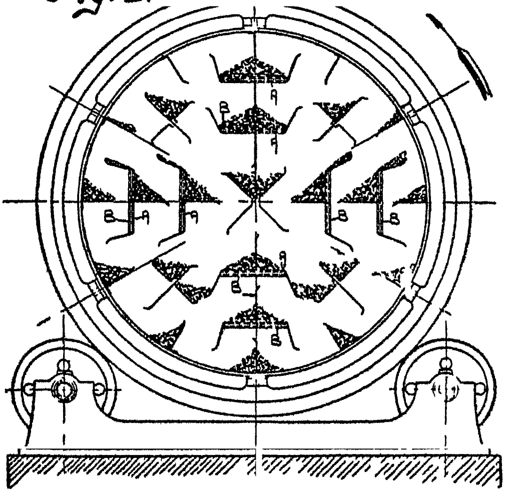
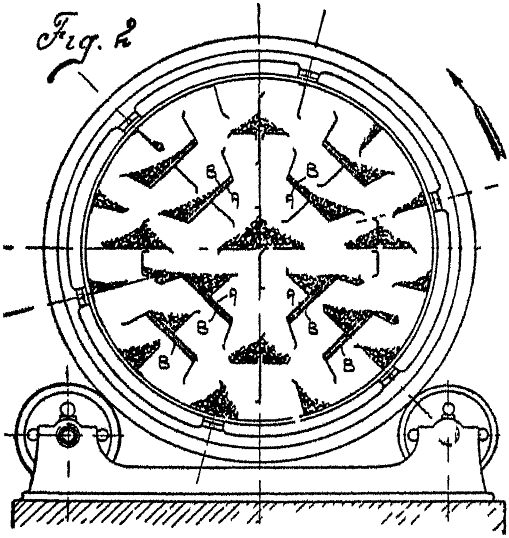


Fig. 2



The universal desiccator is provided with a regulator placed beneath it. The mechanism which revolves the drum allows of a variation in the number of revolutions from 3 to 12 per minute, in order that the rate of the passage of the substance in the machine may be proportional to its moisture-content. This is effected by multiple pulleys. On leaving the drum, the dry material is cooled in a cooling compartment and after having passed through a sorting sieve, can at once be placed in sacks and stored.

Sorting the dried substances is indispensable in the case of leafy substances, to which soil adheres during growth and gathering, in order that no particles injurious to animals may be left in the dried fodder.

This universal desiccator is made in different sizes and for different purposes.

1075 – **New Pump for Farm Work.** — MONIN in *Vie à la Campagne*, Vol. XIV, No.163, p. 29. Paris, July 1, 1913

This pump is distinguished by its extreme simplicity, by the facility with which it can be set and by its perfectly uniform action.

It consists, as may be seen from the annexed figures, of a cylindrical body closed on two sides by plates, one of which bears the suction pipe and the other the forcing pipe. Within the body revolves another cylinder, in each of the faces of which a deep groove is cut at right angles to the one at the other end, and a block of metal like a water-tight piston slides in each of the grooves. These blocks are traversed and driven by two diametrically opposed excentrics fixed on the driving shaft, which occupies a slightly excentric position towards the axis of the cylindrical body of the pump.

Fig. 1 is a section of the apparatus showing the arrangement of the working parts. Fig. 2 is a perspective view of the movable parts. Figs. 3 to 7 show the successive positions taken up by the several pieces during one complete revolution of the driving shaft. Fig. 8 shows the pump without the front plate and fig. 10 the body and the working parts separately.

1076 – **Review of Patents.**

Tillage implements and machines.

261 745 (Germany). Spring-bolt regulator for lateral displacement of double- furrow balance ploughs.
261 940 (Germany). Tractor for common ploughs.
60 719 (Austria). Motor plough.
1 067 111 (United States). Plough.
1 067 068 (United States). Plough attachment
1 067 065 (United States). Harrow.
1 066 323 (United States). Plough and cultivator.
453 081 (France). Agricultural tractor.
455 362 (France). Regulator for ploughs.
6 361 (England). Traction engines.
7 814 (England). Harrows.
131 522 (Italy). Improvements in mechanical ploughing tackle.
131 440 (Italy). New system for mechanical ploughing and cultivation.
131 836 (Italy). Arrangement for simultaneous ploughing and harrowing.

Fig 1

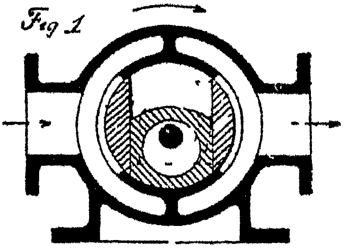


Fig 2

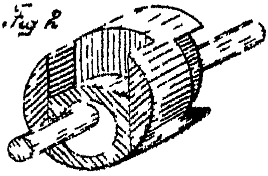


Fig 3

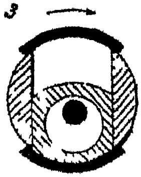


Fig 4

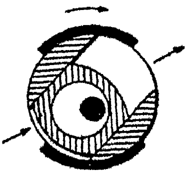


Fig 5

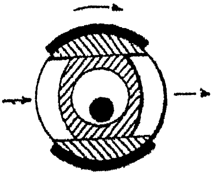


Fig 6

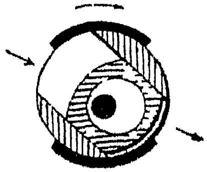


Fig 7

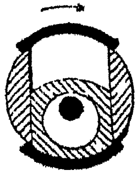
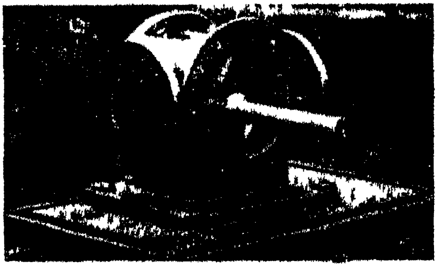


Fig. 8

Fig. 9



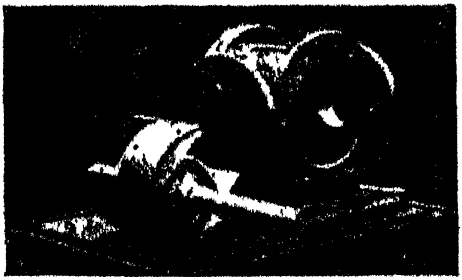
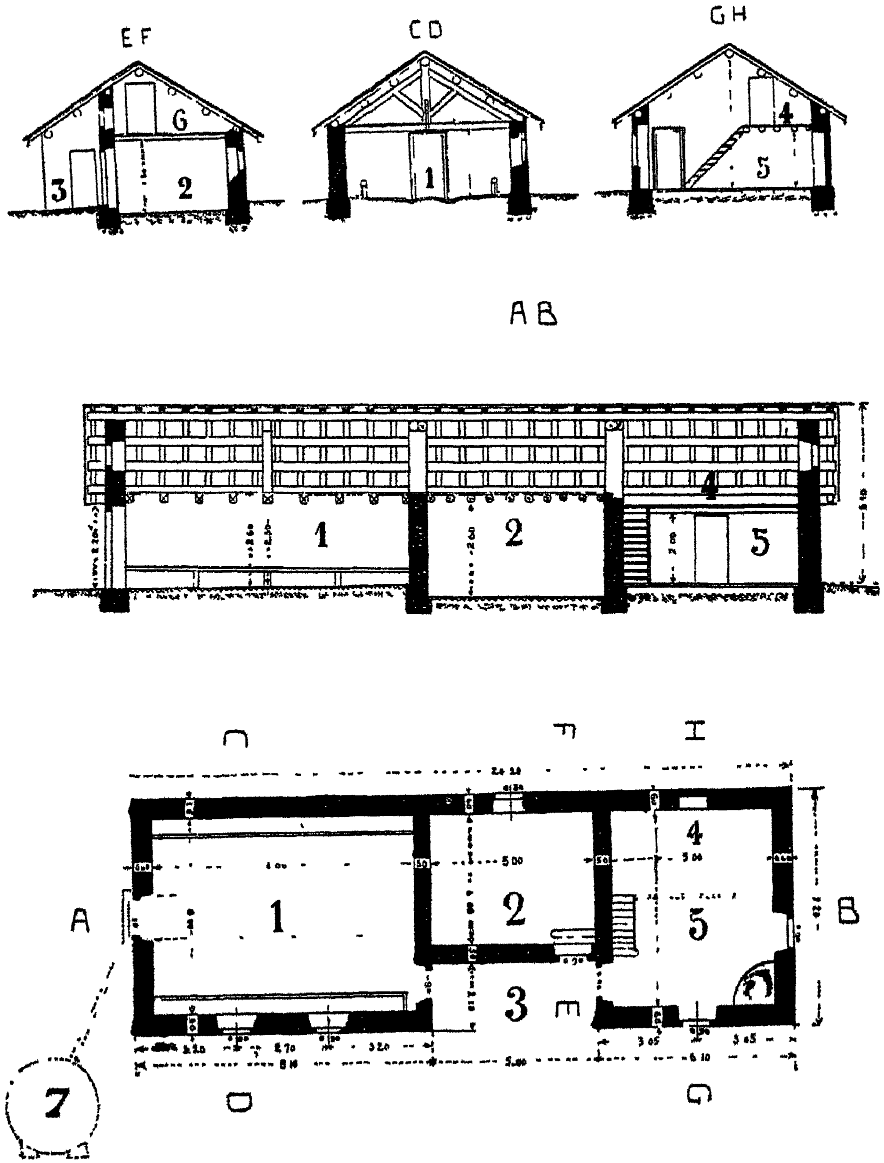


Fig 10



Alpine cheese-shed.

1. Cow-shed.
2. Cheese room.
3. Porch.
4. Sleeping-room.
5. Kitchen.
6. Sleeping-room.
7. Manure pit.

N. B. — The measurements are in meters: 1 meter = 3 ft. 3 in. (very nearly).

60 912 (Switzerland) Mechanical cultivation outfit worked by electric motor.
60 913 (Switzerland). Grass harrow

Manure distributors.

261 566 (Germany) Manure distributor with distributing axle in the hopper.
453 043 (France). Manure distributor for vineyards
455 416 (France). Portable manure distributor with fans.

Drills.

261 614 (Germany). Drill with agitating wheels and distributing surfaces in conjunction with them.
453 961 (France). Drill.

Reapers and mowers.

261 747 (Germany). Arrangement for converting a mower into a reaper.
261 748 (Germany). Rotary cone-shaped ear-separator for reapers.
60 654 (Austria) Reaper with discharging rake.
1 065 946 (United States). Mower attachment.
453 538 (France). Lawn mower improvements.

Machines for lifting root crops.

261 978 (Germany). Potato lifter, in which the potatoes are carried into a revolving sieve drum, which also acts as the driving wheel.
453 371 (France) Potato lifter

Threshing machines

261 895 (Germany). Short-straw sieve for threshers.
1 066 024 (United States). Thresher-Cylinder.
131 595 (Italy). Improvement of the beaters in threshing machines.

Other agricultural machines and implements.

261 750 (Germany). Milking machine, in which the caps consist of one fixed and one movable part.
60 661 (Austria). Knife-sharpening machine.
60 773 (Austria). Transplanting apparatus.
1 066 467 (United States). Hay-press.
453 326 (France) Cereal weed-sprayer, for use with sulphuric acid.
6 281 (England) Cow-milkers.
131 624 (Italy). Continuous-action drier with automatic delivery, for cereals and other materials,
60 695 (Switzerland). Drier for grass and cereals.

1077 – **Alpine Cheese Shed.** – *Il Caseificio moderno*, Year 6, No. 14, pp. 216-217. Piacenza, July 15, 1913.

BUILDING-CONSTRUCTION

This building, designed for the Alps, is intended to arrange under one roof, in a simple and economical manner, a room for treating the milk, a room for ripening the cheeses, a shed for the cows and accommodation for the hands.

In the accompanying plate, the three upper figures show sections through EF, CO and GH of the plan (lowest fig.): the middle figure is a longitudinal section along AB. The scale is 1: 100.

The cow-shed is 8 meters (26 ft. 2 in.) long and can hold 16 to 20 cows; it is connected with the manure pit by a gutter. The cheese-room has a north window and is sunk a few steps so as to keep it cooler and at the same time to allow more space for the sleeping-room above; in front of it is a wide porch, which keeps off sun and rain.

The back part of the kitchen is boarded off at 6ft. 6in. from the floor to form another sleeping-room, to which a wooden step-ladder gives access; there is a door between this and the central sleeping-room. The roof is very simple. The total cost of the building is about £ 196.

RURAL ECONOMICS.

JRAL
NOMICS

1078 - **The Problem of Encouraging a Fresh Development of the Agricultural Production of Germany.** - 1. VON LOCHOW. Landwirtschaftliche Produktionssteigerung auf der bisherigen Fläche. — 2. BESELER. Landwirtschaftliche Produktionssteigerung durch Vermehrung der Kulturfläche. — 3. SERING. Landwirtschaftliche Produktionssteigerung durch innere Kolonisation. — *Archiv des Deutschen Landwirtschaftsrats*, Year 37 (Report of the Proceedings of the 41st General Assembly of the German Agricultural Council, Feb. 11-13, 1913) pp. 53-77. Berlin, 1913.

1. From 1885 to 1889 the mean production of cereals in Germany was 1195 lbs. per acre, while from 1905 to 1909 it was 1624 lbs.; the increase in twenty years has thus been 36 per cent. During the same period the yield of potatoes rose from 9010 lbs. to 12400 lbs. per acre. Von Lochow refers to the data of his own farm to show that this production could be considerably increased by suitable systematic selection, based on yield, and this apart from any increase due to heavier manuring or better cultivation. He shows how this method has been applied to rye, and quotes the results obtained with both rye and oats.

If Germany's rye crop were increased by 10 per cent., the increase in the agricultural production involved would be worth nearly £ 400 000. Similar results could be obtained with wheat, barley, potatoes, sugar-beets and in particular green crops.

The production of live stock would also be considerably increased by the adoption of selection based on productivity. The writer illustrates this point by reference to figures from the Milk Control Societies compared with those from uncontrolled cows; it appears that an average increase of 50*s* per head of dairy cattle can readily be obtained, giving £ 27 000 000 for 11 million animals. The poultry industry, too, might give far larger yields by the adoption of proper selection. But to get small farmers in particular to take up this question more than they have done so far requires educational work : this could best be accomplished by arranging peripatetic lectureships.

2. Beseler deals with the increasing of the German production by extending the area under cultivation. According to Fleischer's calculations there are 8.7 million acres of waste moorland in Germany which might be brought under cultivation and yield three-quarters of a million tons of meat a year, without reckoning other produce; this area could support 70 000 families on holdings of varying extent. Taking the ton of meat at £ 40, the extra production obtained would be worth something like 30 millions sterling. The writer dwells briefly on the progress realized in the cultivation of moors and sandy heaths, and estimates that the

capital required to bring such land in Germany under cultivation is about 100 millions; this would be well spent, as it would give an increase of the total production of the country, and further would contribute to the development of certain industries, in particular to that of chemical manures, as these would be required for the extra cultivated area.

3. Home colonisation aims at the most intensive utilization possible of the available land. Its economic task is to increase the bulk of the agricultural production. Dr. Sering shows that home colonisation fulfils this aim not only as regards the products of live stock — in peasant properties of 12 to 50 acres there are 30 head of large stock per 100 acres as compared with only 14 on large holdings of over 250 acres — but also for field produce. Dr. Keup and Richard Mührer have determined the average increase of production due to home colonisation in East Prussia with as much accuracy as possible (1). Their results show that the stock of horned cattle has doubled or even tripled in a few years, while the number of pigs has tripled or quadrupled. The farms are now regularly distributed over the whole area, allowing all parts to be intensively cultivated: the difference between fields round the steading and distant ones has disappeared, and the rotation is thoroughly adapted to local soil conditions. Labour is both more abundant and better suited to the requirements than previously, for at the busy seasons of seed-time and harvest all the members of the family can help. As the amount of dung available in the new colonies is two-and-a-half or three times as much as before, and the use of chemical manures has not fallen off, it is quite natural that the production has increased considerably. The dividing up of the land among the peasants has led to an extension of cereal-growing; as a result of this, in the Pomeranian colonies the production of grain has doubled in ten years, while in those in Neumark it has become half as large again. In spite of the increased home consumption, the amount of produce sent away from the colonies is greater by 40 to 140 per cent. than that from the original farms. The writer estimates the area capable of division into small peasant holdings in East Prussia (excluding the province of Posen) at 6 100 000 acres. But large properties whose owners possess the intelligence, knowledge and energy required to apply the results of technical and scientific progress to them, should be preserved as agricultural models for the small holders.

1079 – **The Agricultural Conditions of the Province of East Prussia.** — HANSEN in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 21, pp. 241-249. Hanover, May 23, 1913.

According to the 1907 statistics of professions, out of the 2 003 339 inhabitants of East Prussia, 1 028 608, or 51.3 per cent., were engaged in agriculture; for the whole Kingdom of Prussia the average agricultural population is only 27.4 per cent., while in the Province of Saxony it is 25.7 per cent. and in the Rhenish Province as low as 16.9 per cent.

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(1) ERICH KEUP and RICHARD MÜHRER. Die volkswirtschaftliche Bedeutung von Gross- und Kleinbetrieb in der Landwirtschaft. Berlin: Parey, 1913.

(*Author's note*).

East Prussia, forming a part of the lowland plain of Northern Germany, is largely low-lying, and it is only here and there, particularly in the south of the Province, that ranges of hills reaching 1000 ft. occur. In general light sandy soils prevail in the south, while more or less heavy loams characterize the lower ground in the north.

The climate is severe; the mean temperature from December to March is below 0°C. (32° F.). Except for a narrow littoral belt, the Province has a markedly continental climate, with great contrast between the heat in summer and the cold in winter, which is often very severe: the summer maximum is over 30° C. (86° F.) and the winter minimum below — 20° C. (— 4° F.). Owing to the short vegetative period, spring work on the land has to begin very late, while in autumn work is stopped early.

The means of communication and transport, which were formerly very difficult, have been much improved recently by the opening of State and secondary railway lines, which have greatly facilitated the disposal of agricultural produce. In this way East Prussia has been brought into much closer contact with the western markets, as is evident from the equalization of prices between Eastern and Western Germany. In the decade 1861-70 the price of a ton of wheat in Rhenish Prussia was 27*s* 6*d* higher than in East Prussia, while for rye it was 34*s* higher; in 1901-05 these difference were respectively 8*s* 8*d* and 10*s*. Between 1861-70 and 1900-05 the price of beef rose 29 per cent. in Rhenish Prussia and 72 per cent. in East Prussia.

The total area is 9 150 000 acres; the number of farms is 219 245. The 1907 statistics give the following data on the distribution of the land among the holdings of different sizes:

Classification according to size	Percentage of number of farms				Percentage of area farmed			
	East Prussia	Province of Saxony	Rhenish Prussia	Kingdom of Prussia	East Prussia	Province of Saxony	Rhenish Prussia	Kingdom of Prussia
Under 5 acres	52.2	69.5	70.9	61.8	2.2	6.5	11.9	4.8
5-12½ acres	14.9	10.9	15.4	15.3	4.3	6.7	20.0	8.1
12½-50 acres	20.1	14.3	12.3	17.1	17.6	26.7	44.6	27.7
50-250 acres	11.3	4.8	1.3	5.2	38.8	34.1	20.3	31.3
Over 250 acres	1.5	0.5	0.1	0.6	37.1	26.0	3.2	28.1
Over 500 acres	—	—	—	—	28.2	19.5	0.5	22.6

Thus over a quarter of the area under cultivation consists of properties of over 500 acres, while farms of under 50 acres (the first three classes) do not make quite a quarter. The efforts towards changing this proportion in favour of the smaller holdings by means of home colonization are centred in the East Prussian Rural Association (Ostpreussische Landgesellschaft); this body, up to the end of 1912, had started 1221 new independent farms of various sizes, but all less than 125 acres.

The farmers of East Prussia rent only 5.9 per cent. of their land, as compared with 13.3 per cent. for the whole kingdom and 20.5 per cent. for the Province of Saxony. Out of every 100 strictly agricultural holdings in East Prussia, 87 are owned by their occupiers and 8 others are half owned.

The 1900 statistics show the following utilization of the land:

	Province of East Prussia — per cent	Kingdom of Prussia — per cent
Arable and garden land	55.3	50.7
Meadow	11.2	9.4
Pasture	6.9	5.9
Forest and copse	17.4	23.7
Space occupied by houses and yards, wastes, roads, streams, etc.	9.2	10.3

The arable and garden land is divided as follows:

	Province of East Prussia — per cent	Kingdom of Prussia — per cent
Cereal and pulse crops	57.2	61.9
Hoed crops	10.2	17.6
Industrial crops	0.4	0.6
Green crops	12.9	9.5
Temporary grass land	7.6	5.1
Fallow	10.8	4.2
Gardens and fruit plantations	0.9	1.1

The reason for the smallness of the area devoted to hoed crops and the size of that under fallow is to be sought in climatic conditions; the intensive cultivation of green crops and the high proportion of temporary grassland show that live stock is of great importance in East Prussia.

In the last few years a great number of permanent improvements have been made; drainage has made great progress, and much activity is being displayed in the reclamation of marshes and the laying down of permanent pastures. The use of chemical manures is increasing rapidly, both on arable land and on permanent grassland.

The rotations at present followed in East Prussia are based on an improved extensive culture rotation of arable land and leys (geregelte Feldgrasswirtschaft); they may be called modified four-course rotations.

Climatic and economic conditions combine to make East Prussia specially suitable for live-stock raising. The live-stock census figures for 1873 and 1911 are as follows:

	Province of East Prussia			Kingdom of Prussia		
	1873	1911	Difference	1873	1911	Difference
			per cent.			per cent.
Horses	350 478	489 655	+ 40	2 282 435	3 171 579	+ 39
Cattle	785 646	1 204 889	+ 53	8 639 514	11 682 234	+ 35
Sheep	1 841 437	379 879	— 79	19 666 794	4 372 489	— 78
Pigs	463 718	1 489 292	+ 221	4 294 926	17 244 855	+ 302

The breeding of horses in East Prussia is famous throughout the world. Almost all the breeding of pedigree half-bloods is carried on by the peasant-proprietors, who use the mares for field work and put them to State stallions. The foals are sold to larger proprietors who have at their disposal the wide extents of pasture necessary for rearing them. For some time the breeding of heavy horses has also been undertaken in East Prussia; the stock was built up from Belgians from the Rhine Province.

Cattle have developed enormously: East Prussia now forms a field of intensive breeding of the Black-and-white Lowland breed; this will be further encouraged by strong Herdbook Societies, Control Societies and Breeders' Associations.

All the measures tending to the encouragement of agriculture spring either from the Chamber of Agriculture for the Province of East Prussia or from the three Central Agricultural Societies; the latter, with 350 affiliated societies, number some 20 000 members.

Agricultural education is imparted by the Agricultural Institute of the Royal University of Königsberg, by two Agricultural Colleges, 19 winter agricultural schools, two institutes for dairy instruction, and one school each for domestic economy, meadow cultivation and horticulture. The directors of the winter schools also act as peripatetic instructors in agriculture, as do five live stock instructors, one poultry inspector, one dairy instructor and three fruit inspectors.

Land credit is undertaken by the "Ostpreussische Landschaft"; credit for agricultural improvements is provided by the auxiliary Provincial Pay-Office. There are three great Cooperative Unions; besides them there are numerous cooperative dairies, and associations for sale and purchase, producers' associations, etc. The Cooperative Book-keeping Association of Königsberg occupies a place by itself; it was founded in 1904 at Insterburg, and now closes the books of about 150 farms.

1080 - **Difference in the Returns of two Dairy Farms and its Causes.** — WÜSTENDÖRFER, KURT. Zur Frage der Rentabilität der Abmelkwirtschaft. — *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 56, pp. 516-518. Berlin, July 12, 1913.

The writer calculates the utilization value of the unmarketable food consumed by the milch cows on two dairy farms in which no breeding is carried on, and from this draws inferences as to their returns.

Farm A is close to a large town on the Rhine. Its area is 445 acres; in 1911 there were 68 acres under sugar-beets and 25 acres under mangels. There is no permanent grassland. Consequently there is a plentiful supply of fresh and ensilaged beet slices and leaves, but little hay. The feeding is not excessive.

Table I shows the purchase and sale price of the cows, their depreciation and the length of time they were kept.

TABLE I.

Year	Purchase price		Sale price		Depreciation per cow		Three-year averages of depreciation		Length of time kept
	£	s	£	s	£	s	£	s	
1906	28	5	24	4	4	1	—		10.8
1907	25	5	21	10	3	15	4	1	11.2
1908	24	2	20	8	3	14			11.8
1909	24	1	19	7	4	14			10.5
1910	26	7	21	4	5	13	4	13	11.1
1911	27	2	23	9	3	13			11.9

The average sale price reckoned has been increased by the amount of the losses by death and diminished by the amount received by sale of calves.

The average milk-yield per cow in 1911 was 1104 gallons. The average price made by the milk was 1*s* per gallon (1*s* 1*d* for milk in bottles, 1*s* in cans and 9 ½ *d* and 9 *d* for large orders). The cows are mostly bought in full milk, rarely just after calving. Purchase and sale are carried out through an agent. The cows are not put to the bull. In 1911 the average herd was 88 head (mostly black-and-white East Friesians). The cows are attended to by five men and a woman. The distribution of the milk is done by six carts.

The expenses for 1911 were as follows :

	£	s	d
Attendance	389	2	3
Rent of stable (£1225 at 6 %)	97	10	0
Utensils (£150 at 6 %)			
Lighting (petroleum) £ 15			
Fire insurance	1	7	6
Interest on capital in cows (£2385 at 4 %)	95	8	0
Interest on working capital (£6 2*s* 6*d* per cow, at 4 %) .	21	11	3
Veterinary attendance and medicine.	24	10	0
Depreciation of cows	321	15	3
Administration expenses (accounts, offices and manager) . .	101	14	6
Sale expenses	937	5	0
Expenses of collecting debts	11	15	6
	£2001	19	0
Concentrated foods	1507	15	0
	£3509	14	0

Against this there is the sum of £ 4874 13*s* 9*d* by sale of milk.

The calculation of the value of the food consumed was made according to Brinkmann's formula :

$$F = \frac{V - (G - g)\,P}{}$$

F is the feeding-value of 1 kg. (2.2 lbs.) of starch value in the home-grown produce to be used as the basis of the ration; *V* is the utilization value of the food; *G* is the total content of the ration in starch values, *g* the content of the basal food in starch values; *P* is the average price of 1 kg. of starch value over all the concentrated foods. (*G*-*g*) *P* is therefore the purchase price of all the concentrated food, *i. e.* £1507 15*s*; *V* is the revenue from the sale of milk less the cost of production (leaving out the concentrated foods), *i. e.* £4874 13s 9*d* - £2001 19*s*. The total content of the basal food in starch values is £ 4672 12s. We thus get :

$$F = \frac{£4874\ 13s\ 9d - £2001\ 19s - £1507\ 15s}{4672.6}, = 0\ 2921\,s\text{, or about } 3\tfrac{1}{2}d$$

The basal food for 1911 should therefore be valued as follows :

			£	s	d
Total basal food			1365	3	6
Hay (2 tons 7 cwt)	per	ton	4	10	3
Oat straw (43 tons 16 cwt.)	»	»	2	9	6
Chaff, half wheat, half oats (29 tons 4 cwt.)	»	»	3	17	0
Mangels (285 tons 14 cwt.)	»	»		18	3
Wet beet-slices (181 tons 11 cwt.)	»	»		14	6
Beet-slice silage (80 tons 3 cwt.)	»	»		19	0
Beet and mangel leaf silage, half-and-half (468 tons 13 cwt.)	»	»	1	5	3
Green rye (2 tons 2 ¾ cwt.)	»	»	1	12	9
Green maize (50 tons 2 cwt.)	»	»	1	6	6

The utilization value is thus highly satisfactory.

Farm *B* has an area of 315 acres and is 17 ½ miles from the same town; the milk is sent three-quarters of a mile by road and the rest by rail to a milk-seller. The cows, mostly East Friesians, are bought from a dealer, generally lately calved and rarely in full milk. The average number in the herd is 54. Table II shows the average purchase and sale prices, and the depreciation per cow.

TABLE II.

Year	Purchase price		Sale price		Depreciation per cow		Three-year averages of depreciation	
	£	s	£	s	£	s	£	s
1898-1899	20	2	15	19	4	3	3	16
1899-1900	20	1	16	13	3	4		
1903-1904	21	15	18	7	3	4	4	4
1904-1905	22	16	17	7	5	10		
1905-1906	23	2	19	8	3	14		
1906-1907	26	1	19	11	6	10	6	12
1907-1908	26	1	19	13	6	8		
1908-1909	25	7	18	9	6	18		
1909-1910	25	18	17	14	8	4	7	1
1910-1911	27	5	19	15	7	11		
1911-1912	27	7	22	0	5	7		

The cows are not put to the bull. The average milk yield per cow in the last year was 1122 gallons. The feeding is rather heavy, as each cow gets about 16 lbs. of concentrated food per day, summer and winter. The animals are looked after by a cowman and his son and two daughters.

The valuation of the food consumed by the cows on farm *B* is shown in Table III.

TABLE III.

Year	Receipts from sale of milk		Receipts from sale of fat cattle		Value of milk consumed in the house (1.1 gallon per day)		Total receipts		Labour		Cost of milch cows		Concentrated food		Rent of stable and dairy (£ 400 at 6 %)
	£	s	£	s	£	s	£	s	£	s	£	s	£	s	£
1898-99	1 071	11	877	7	10	15	1 959	12	150	9	1 226	1	664	15	24
1899-00	1 092	13	816	2	11	12	1 920	7	150	9	862	8	686	17	24
1903-04	1 297	16	1 028	11	11	12	2 337	19	150	9	1 436	14	654	15	24
1904-05	1 391	1	1 005	0	12	11	2 408	12	168	6	1 117	11	765	12	24
1905-06	1 620	15	1 337	19	12	11	2 971	5	168	6	1 617	5	960	7	24
1906-07	1 730	4	1 173	12	12	11	2 916	7	183	2	1 613	11	1 026	9	24
1907-08	1 805	7	902	17	13	9	2 721	13	189	13	1 300	19	1 007	8	24
1908-09	1 942	7	905	2	13	9	2 860	17	189	13	1 318	17	1 218	18	24
1909-10	2 026	10	1 169	8	13	9	3 209	7	189	13	1 658	16	1 134	12	24
1910-11	2 062	3	1 149	18	13	9	3 225	9	183	15	1 526	19	1 318	3	24
1911-12	1 954	2	1 363	11	14	15	3 332	9	183	15	1 723	15	1 302	11	24

(1) As the figures for the fixed items are rounded up, the sums of the items do not exactly agree with the

These figures show that the utilization value of the home-grown food (clover, beet leaves and chaff) is small. In five of the years, fairly evenly distributed over the period under consideration, this value is a negative quantity, or in other words the full interest on the live and dead stock is not paid. This shows that if certain conditions are not fulfilled, the returns from this type of dairy farming may be small, in spite of large receipts from the sale of milk.

The great difference in the returns from the two farms is attributed by the writer to the following circumstances: The favourable return from farm *A* is due to the small amount of the depreciation per cow, the judicious use of concentrated foods, the moderate intensity of feeding and the gain from retailing the milk. As the total expenses of retailing were 2.57 pence per gallon and the difference between the retail and wholesale prices was 3.22

TABLE III.

Interest, amortization and upkeep of utensils		Lighting (electric from 1908)	Administration: £15 Vet. and medicine: £6	Interest on capital in cows		Interest on working capital		Interest, amortization and upkeep of horse and cart		Carriage of milk		Total expenses (1)		Value of foods		Three-year averages of value of foods	
£	s	£	£	£	s	£	s	£	s	£	s	£	s	£	s	£	s
4	0	3	21	42	1	10	12	17	18	26	17	2 189	11	—229	19	—74	11
4	0	3	21	38	11	10	12	17	18	26	17	1 839	10	80	16		
4	0	3	21	49	6	10	12	17	18	26	17	2 397	8	—59	9	69	13
4	0	3	21	42	9	10	12	17	18	26	17	2 200	4	208	8		
4	0	3	21	59	2	10	12	17	18	26	17	2 911	5	60	0		
4	0	3	21	55	15	13	5	17	18	26	17	2 987	16	—71	9	—7	11
4	0	3	21	44	2	13	5	17	18	26	17	2 650	19	70	14		
4	0	5	21	44	10	13	5	17	18	26	17	2 882	15	—21	17		
4	15	5	21	56	11	13	5	17	18	26	17	3 151	4	58	3	12	18
4	15	5	21	53	9	13	5	17	18	26	17	3 193	18	31	11		
4	15	5	21	61	15	13	5	17	18	26	17	3 383	9	—51	0		

totals in this column, exceeding them by about 3 s. (*Ed.*).

pence, the gain on retailing is 0.65 of a penny; on a yield of 1104 gallons this means a yearly gain per cow of £3. The unfavourable results of farm *B* are attributable to the large depreciation per cow and the heavy bill for concentrated foods. The small amount of home-grown food should be noticed in this connection: ensilaged beet-leaves were first used in 1909-10 and then only in small quantities, while mangels are quite lacking. This increase in cost of food brings only a slight saving in labour. It is thus seen that along with the price made by the milk the personality of the farmer is a primary determining factor in the profitableness of the concern; the more he possesses the qualities necessary for the head of such a farm, namely sound judgment for the animals he purchases, ability in dealing and the capability of fixing on technically sound rations, the better will be the results of his dairy farming.

1081 - **Collective Renting of Farms.** — RAMBAUD in *Annales de l'Ecole Nationale d'Agriculture de Grignon*, Vol. 3, pp. 107-135. Paris, 1912.

Collective renting has been practised in Italy for some twelve years. The chief object of the system is to do without the middleman (gabellotto), to whom small tenants had formerly to apply, by taking on leases of farms and land direct by means of a cooperative renting association; a further idea is to obtain at any rate a partial remedy for the unemployment occurring at certain seasons, by bringing waste land under cultivation and introducing intensive methods.

In Upper Italy there are at present 22 of these renting associations, cultivating, 17 400 acres; in Sicily there are 43, with 62 962 acres. The land rented may be farmed either collectively or separately by the members of the cooperative association.

In 1907 there were 106 such associations in Rumania, with 14 000 members cultivating 188 000 acres and paying an annual rent of £93 000. In 1909 the number had increased to 300, with 445 000 acres rented for nearly £200 000. The land is divided among the members in holdings not exceeding 25 acres, and varying according to the working capacity of the member's family.

Collective renting is also practised in Bohemia (among the Czechs), Hungary and Servia. The writer discusses the results obtained in Italy, and expresses the hope that this system may be introduced into France.

1082 - **Efforts towards the Economic and Social Improvement of the Conditions of the Agricultural Labourers.** — VON BATOCKI in *Archiv des Deutschen Landwirtschaftsrats*, Year 37 (Report of the Proceedings of the 41st General Assembly of the German Agricultural Council, Feb. 11-14, 1913), pp. 137-146. Berlin, 1913.

The writer believes that the best means towards reducing rural depopulation and creating and maintaining a fixed class of agricultural labourers is to improve economic and social conditions in the country. This would involve: extension of the area cultivated by labourers, as far as this is possible; making stock keeping possible (milch cows and breeding of small stock); utilization of animal products by cooperative means; wages in kind; arranging of winter work (forestry work and home industries); technical instruction; adoption of profit sharing; better instruction of the women in domestic economy; regularization of the relations between the employer and his men.

AGRICULTURAL INDUSTRIES.

IRYING

1083 - **The Calorific Value of Milk in relation to its Price and its Nutritive Value.** — ASCETTI, G. in *L'industria lattiera e zootecnica*, Year XI, No. 12, pp. 183-184. Reggio-Emilia, June 15, 1913.

The idea that a knowledge of the butter-content of milk is sufficient indication of its value, and often also of its purity, is the foundation of the commercal valuation of this article and is also relied upon in most municipal regulations for the control of milk. The adoption of this criterium gives rise to differences of opinion and scientific and legal criticisms in prosecutions for fraud made by the public authorities against dairies; and this result is quite natural, as it is only in such cases as butter factories, in which the fat is the only ingredient required, that the method is sound. With milk for use in cheese-factories, or as human food, it is not feasible to leave out of account the other constituents, especially the casein and the lactose. Experience has shown that the milks richest in fat do not necessarily give large and high-class products; and it often happens that a lack in fat is made up by abundance of protein.

All these considerations serve to explain why search has been made for other methods, as simple and exact as possible, for valuing and comparing milks for industrial use and for food. Dr. F. I. Herz, Government inspector of cheese-factories at Munich, describes one of these methods in two pamphlets ("Milch, Butter, Käse" and "Die Milch und ihre Erzeugnisse für die Volksernährung", Berlin, 1913); it consists in the determination of the calorific energy in 100 grams of the milk. This energy is believed to be proportional to the nutritive value of the milk, which should be taken as the basis of its trade value.

Dr. Herz gives tables for the determination of the calorific energy from the specific gravity and the fat content. He arrives at this by calculating the solids not fat, using Vieth's relationship between the constituents and taking the number of calories developed by one gram of protein, sugar and fat.

When the fat and specific gravity of a milk have been determined, the solids not fat may be ascertained by using the following formula:

$$S.N.F. = \frac{g+1}{4} + \frac{f}{5}$$

in which g = the excess of the specific gravity over 1 multiplied by 1000, and f = the percentage of fat. Thus, a milk with S. G. 1.0315 and fat 3.6 per cent., would have solids not fat:

$$S.N.F. = \frac{31.5+1}{4} + \frac{3.6}{5} = 8.84$$

Applying Vieth's relationship, that is the proportion sugar: protein: ash = 13 : 9 : 2, the percentages of sugar and protein would be respectively 4.83 and 3.31. To get the calorific value (Wärmewert) these figures must be multiplied by the number of calories that one gram of each of the substances will produce on combustion, namely 4.1 for proteins and sugars and 9.3 for fats.

All these calculations have been reduced to one simple formula:

$$S.N.F. = g - 1 + 10f.$$

For a milk of S. G. 1.032, containing 3.6 per cent. of fat, we have:

$$S.N.F. = 32 - 1 + 36 = 67$$

According to Dr. Herz, milks with normal proportions of fat, protein and lactose have a calorific value of between 65 and 70. The writer considers the method very ingenious and also trustworthy, seeing it is based on positive experimental data regarding all the useful components of the milk.

The use of this figure for judging the purity and goodness of milk involves no addition to the work of analysis, as the specific gravity and fat content are always determined in milk control; it has the advantage of referring the whole to a single figure, which varies within very narrow limits, for it is well known that though one constituent of milk may show considerable deviations from the normal, these are generally balanced by the other constituents. When these figures are fixed for any given milk-producing district, the characters will be readily recognized and can form the basis for municipal regulations for fixing the type of milk in the district.

The figures may also be used for selecting the best milch cows, as well as for the selection of milks for rearing infants by hand.

1084 - ***Micrococcus mucofaciens,* New Bacterium of Ropy, Slimy Milk.** - THÖNI; J. in *Schweizerisches Zentralblatt für Milchwirtschaft*, Year II, No. 29, p. 230. Brugg, July 17, 1913.

This new bacterium which has been isolated from commercial milk by the writer, if cultivated in pure cultures on gelatine, causes a sterilized milk to become ropy at normal temperatures after 18 to 42 hours and alters it to such an extent that under an upper thick layer of cream a yellow brownish slimy layer is formed; this is thin at first but gradually grows thicker; under these two layers there is one of creamless milk apparently sound. At 35° C. the milk becomes slimy after 14 or 16 hours. In order to destroy this micro-organism it is sufficient to heat the milk to 70° C. for five minutes; treating the milk with 1 per cent. of milk of lime for half an hour has the same effect.

1085 - **The Classification of Lactic Acid Bacteria.** — GORINI, COSTANTINO in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 37, No. 17-21, pp. 452-460. Jena, May 1913.

The writer criticizes the principles according to which the lactic acid bacteria have been hitherto classified and he expresses the opinion that this classification should be based especially on the physiological characters and not exclusively upon the morphological ones.

The principal points to which he has for many years successfully devoted his attention are the following: Behaviour of bacteria at different temperatures, rapidity of coagulation, duration of the vital period, gas-producing, caseolytic and acidifying power, and characters of the products of caseolysis.

1086 - **Preparation and Use of Yoghurt.** — WIEGERT, ELISABETH in *Molkerei Zeitung*, Year 23, No. 28, pp. 326-328. Berlin, July 12, 1913.

The writer describes the virtues of Yoghurt (curative properties for diseases of the liver and kidneys, disinfectant power and favourable action on animal metabolism).

She next states as the result of numerous experiments, that the preparation known in trade under the name of « Yoghurt-Maya-Ferment » and most of the dry preparations are not satisfactory for making Yoghurt, and lastly she describes a process both simple and economical for preparing Yoghurt in the household.

1087 - **Factors influencing the Change in Flavour in Storage Butter.** — ROGERS, L. A., BERG, W. N., POLTEIGER, C. R., and DAVIS, R. T. — *U. S. Dept. of Agriculture, Bureau of Animal Industry, Bulletin* No. 162, pp. 69. Washington, April 1913.

The influence which organisms exert on the odour of milk, cheese and other products of the dairy suggests a similar explanation of the changes which take place in stored butter.

Jensen has shown that under certain conditions bacteria do multiply in butter and have a direct influence on the flavour of the product. The writers have found no evidence of bacterial growth under normal conditions in their samples of butter, but have noticed a small multiplication of torula at high temperatures. In these cases there was no apparent relation between the growth of torula and the change in flavour. Moreover the same changes took place in duplicate lots of butter at temperatures so far below the freezing point that there could be no possibility of growth. The writers point out that the salt content of American butter is equivalent to an aqueous solution of 18 % or more, a concentration sufficient to prevent or at least retard bacterial growth, whilst that of European butter is considerably less. This led them to suggest the possible influence of lipolytic enzymes, but it was found that butter may show a marked change in flavour without any appreciable hydrolysis of the fat. There remained the possibility of proteolytic enzymes and of chemical changes of an oxidative nature. The presence of water bacteria and the proteolytic enzyme of milk known as galactase would favour proteolytic changes in butter. Other investigators had already shown that under comparatively high temperatures and low salt concentration the butter proteins undergo changes.

The present work is concerned with investigation into the influence of low temperatures and high salt concentrations on the activity of galactase in butter made from pasteurised and unpasteurised cream. The writer found that the ordinary method of determining the extent of proteolysis were not sufficiently delicate and were influenced by such factors as salt content on the precipitability of casein.

They therefore devised a method of removing considerable portions of the fat and casein by a system of decantation previous to applying the chemical methods of estimating the hydrolysed proteins. They found this method much more delicate in its results and showed that proteolysis did not take place to any appreciable extent in either pasteurised or unpasteurised butter, nor was there any relation between the figures for nitrogen and the butter scores.

Only in the presence of very large amounts of strongly active proteolytic enzymes, did they find hydrolysis to occur under conditions of cold storage and high salt content, and there is no reason to suppose that such amounts of enzymes are ever found in butter.

The possibility of the action of enzymes liberated by the death of bacteria was then investigated.

They found that whilst there was a marked difference in the rate of deterioration in the raw cream butter and the pasteurized cream butter the reinoculation of the cream with bacteria had little or no effect on the keeping quality of the butter.

The investigations on the oxidation effect of included air were not conclusive. The authors found no alteration in the carbon dioxide content of the enclosed air, but a decided decrease in the oxygen content. as if part of this gas had been removed. It still remains to be proved that the oxygen was actually removed by some butter constituent. The results showed that butter contains about 10 % by volume of gases.

The effect of metals on butter.

The influence of iron was first investigated and it was found in general that a relatively small part of the iron present in cream goes into the butter as compared with the butter milk, which seems to take most of the iron, and in which the presence of a flavour due to the iron was most noticeable. Various quantities of iron as ferrous sulphate were added to pasteurised cream and the resulting butter was scored for flavour at different periods. It was found that the butters with the added iron showed much quicker deterioration than the control butters. Below a certain point of deterioration differences were not recognisable. The control butters were the last to develop a " fishy" flavour and a most noticeable feature was the development of a very oily flavour as a stepping stone to the " fishy ".

Similar experiments were conducted using copper sulphate and similar results were obtained as in the case of the iron salt.

The deteriorating effect of copper was very pronounced in the case of butter made from cream pasteurised in a copper vessel, the tin coating of which had been worn away. The contact was only for a few seconds, yet a very decided fishy flavour developed in 30 days, whereas control butter from a tin-lined pasteuriser remained quite good. Copper would appear to be more powerful in its effects than iron.

The difference in the absorption of iron by cream in contact with the rusty and clean metal appeared to be insignificant, provided the butter was made under similar conditions. The precise nature of the action of these metals on the cream and butter is not definitely known, but it is supposed that it is of the nature of a catalytic agent in an oxidising process. Experiments lead the writers to believe that the lactose may be oxidised by an organic peroxide in the presence of iron, but further work is necessary before definite conclusions can be drawn.

It was found that no change took place in the lactose content when iron was added to milk containing 18 % sodium chloride even though a current of oxygen was passed through for 72 hours.

Iron salts (particulary ferrous) produce very strong odours when added to milk as the distillate from such milk gave very pronounced iodoform tests. Whether the small amounts of iron ordinarily present in butter

(0.089 %) can slowly bring about the same kind of change that larger amounts of iron bring about in milk in a very much shorter time is to be determined by future investigation.

1088 - **The Manufacture of Cheese from "Heated" Milk** (1). — BENSON, M. and EVANS, R. H. in *The Journal of the Board of Agriculture*, Vol. XX, No. 4, pp. 281-301. London, July 1913.

In 1905 a number of cheddar cheeses were made at the British Dairy Institute, Reading, with milk heated to temperatures of from 150° F. to 180°F. The heating took place in a steam jacketed cheese vat, and an ordinary Lawrence cooler was used for the subsequent cooling. On the whole, those cheeses made from the milk heated to below 165° F. were a success, while those made from milk heated above that temperature were not, being bitter, too moist, and faulty in texture. In 1909-10 a further series of experiments was carried out. In this case the heating was done out of contact with the air in a jacketed cylindrical copper vessel with a tightly fitting lid, and a current of carbon dioxide gas was passed through the milk. The cooling was effected by running cold water through the jacket. A temperature of 210° F. was adopted and great difficulty was experienced in making the cheeses : the coagulation was bad, the curd would not part with its whey, and seemed to have lost its adhesive properties. As a result the cheeses were moist, granular in texture, with a tendency to fall apart and crack, slightly bitter, and inclined to develop a blue mould inside; in other words, though intended for cheddar cheese, they resembled more closely the Wensleydale variety.

In 1912 special apparatus was installed for heating and cooling the milk rapidly out of contact with the air. It consisted essentially of a pasteuriser and of a Lawrence cooler covered in with movable top and side plates, and included also a so-called "retainer" or large drum in which the hot milk might be stored or "retained" if required. During the months of June to August 10 trials were carried out. On each occasion 600 lbs. of milk were employed and divided into 3 equal portions ; one of these was untreated and acted as control, another was subjected to rapid pasteurisation and cooling, and the third was also pasteurised and cooled, but in addition a stream of carbon dioxide was passed through the pasteuriser at the rate of about ½ lb. to 200 lbs. of milk. The temperature of pasteurisation varied from 160° F. to 200° F. in the different trials. Subsequently to treatment, each lot of milk was made into cheddar cheese and all the details of the manufacture are given in a table from which the following figures have been extracted :

In general it may be said that pasteurised milk required less starter than raw milk except when heated above 190° F. but about twice as much rennet for coagulation. As in previous trials the curd was always softer and had a tendency to retain the whey;also it lacked coherence and required more pressure during the pressing stage as well as very secure bandaging.

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(1) See No. 867, *B*. July 1913. (*Ed.*).

Date of manufacture	Number of cheese	Milk heated to		Quantity of rennet used	Acidity in whey from press	Total solids in whey from vat	Max. pressure	Weight of cheese when matured		Points awarded by judges
								3 months	7 months	
1912		Deg. F.		Dchms	% lactic acid	%	cwt.	lbs.	lbs.	%
June 6.	1	84°	—	6 ⅓	1.15	5.88	10	19	17 ½	84
» 6.	2	160°	—	13	0.94	6.23	15	19	17	93
» 6.	3	160°	CO_2	13	0.935	5.90	15	18 ½	17	93
» 13.	4	86°	—	6 ⅓	1.08	6.97	10	19	16 ½	63
» 13.	5	165°	—	14	1.15	8.07	15	18 ¾	17	94
» 13.	6	165°	CO_2	14	0.915	7.05	15	19	17 ½	94
» 20.	7	84°	—	6 ⅓	1.14	5.55	10	19	17 ½	79
» 20.	8	170°	—	14	1.10	6.83	20	19	17 ½	100
» 20.	9	170°	CO_2	14	1.08	5.96	20	19 ¼	17 ½	93
» 27.	10	85°	—	6 ⅓	1.15	7.71	10	19 ¾	18 ½	78
» 27.	11	175°	—	14	0.95	7.08	20	21	18	82
» 27.	12	175°	CO_2	14	0.98	6.77	20	21	18	89
July 11	13	84°	—	6 ⅓	1.03	7.1	10	18 ½	17 ½	87
» 11	14	180°	—	14	1.00	6.97	20	19 ½	18	83
» 11	15	180°	CO_2	14	0.88	6.67	20	19 ½	18	96
» 12	16	84°	—	6 ⅓	0.95	7.08	10	18	17	91
» 12	17	185°	—	14	1.11	7.05	20	18 ¾	17 ½	47(1)
» 12	18	185°	CO_2	14	0.89	6.85	20	19 ¼	17 ½	48(1)
» 18	19	84°	—	6 ⅓	1.15	6.84	10	18 ¾	18	85
» 18	20	185°	—	14	0.91	7.27	20	20 ¾	20	72
» 18	21	185°	CO_2	14	0.72	6.70	20	21 ½	20 ½	82
» 25	22	85°	—	6 ⅓	1.19	9.40	10	19	19	99
» 25	23	190°	—	14	1.17	6.70	25	20 ¾	19	66
» 25	24	190°	CO_2	14	0.935	6.80	25	20 ¾	19 ½	94
August 1	25	84°	—	6 ⅓	1.02	8.01	10	20	19	86
» 1	26	195°	—	14	0.81	6.85	25	21 ¾	20 ½	83
» 1	27	195°	CO_2	14	0.60	7.00	25	22	20 ½	79
» 2	28	85°	—	6 ⅓	0.99	7.14	10	20 ¾	19 ½	98
» 2	29	200°	—	14	0.80	6.97	25	22 ¼	22	89
» 2	30	200°	CO_2	14	0.80	6.20	25	23	22	87

(1) The poor results obtained in these 2 cases were due to faulty manufacture.

The whey from the treated milk presented the desirable green colour and contained a lower percentage of total solids than that from the untreated owing to the precipitation of the albumen in the curd; this was specially noticeable when high temperatures were employed. To ensure equal salinity the pasteurised cheeses invariably required less salt than the unpasteurised ones, and the former matured more slowly and exhitited remarkable keeping qualities; they also gave more even results and were less liable to taint. Owing to the retention of the albumen by the curd, the treated cheeses were on the whole somewhat heavier than the untreated, the difference amounting to from 5 to 9 per cent. The carbon dioxide distinctly improved the coagulating properties of milk at the lower temperatures, but its effect was hardly noticeable above 180° F.; it also appeared to prevent bitterness, but had a deteriorating effect on the colour of the cheeses.

Two experts were appointed to judge the cheeses and, excluding the results of July 12th, the pasteurised cheeses with and without carbon dioxide scored a total of 807 and 762 points respectively, while the controls only scored 759. The pasteurised cheeses were specially successful when the lower temperatures were employed and some first class cheeses were obtained under these conditions, their moist character giving them a very rich appearrance; even with the higher temperatures, they scored a high percentage of points, the loss of points occuring chiefly on account of their mild and somewhat undeveloped flavour.

1089 - **Twelve Months' Meat Supply of the United Kingdom (1911-12).** — TURNBULL, R. E. in *Live Stock Journal*, Vol. LXXVIII, No. 2052, p. 119. London, August 1, 1913.

MEAT INDUSTRY

For the purpose of this account the term "meat" includes home-fed fat cattle, veal calves, fat sheep and lambs, bacon and pork pigs, and imported fat cattle and sheep and imported beef, veal, mutton, lamb, bacon pork, and hams.

The Home-fed supply. — The severe drought in 1911, and the consequent scarcity of food for live stock, naturally resulted in a large number of sheep being marketed for meat that would otherwise have been included in the census of June, 1912.

The total number of sheep and lambs in June, 1911, was 30 480 000, whereas in June, 1912, the number was only 28 967 500, *i. e.* a reduction of 1 512 500. In addition to the usual supply of mutton and lamb, there was therefore that derived from over 1 500 000 sheep and lambs that were marketed because of the drought.

In June, 1911, the number of sows kept for breeding was larger than in any previous census, being 549 080, or 86 200 more than in June, 1910. These additional sows probably increased the supply of pigs in the twelve months June, 1911-12, by about 1 034 000.

The supply of home-fed fat stock, so far from being decreased by a severe drought, is usually largely increased, because stock are marketed in excess, but the cost of fattening is considerably increased, as more feeding-stuffs have to be purchased, and home-grown corn has to be fed to stock that but for scarcity of keep could be sold.

Estimated Supply of Home-fed Stock.

	Number	Estimated av. dressed weight
Fat cattle	1 975 000	45 stones of 14 lb.
Veal calves	1 271 500	90 lb
Fat sheep	10 692 000	68 »
Fat lambs	2 380 000	40 »
Bacon and pork pigs	6 305 500	1 1/5 cwt.
	22 624 000	

	Number	Estimated weight of dressed meat
Cattle and calves	3 246 500	12 131 100 cwt
Sheep and lambs	13 072 000	7 979 100 »
Pigs (for bacon and pork)	6 305 500	7 566 600 »
	22 624 000	27 676 800 cwt.

Value: £87 182 000.

Imported Meat.

	Cwt.
Imported meat	20 938 067
Meat from imported stock	326 193
	21 264 260

Value: £47 545 500

Total Supply.

	Cwt.
Home-fed meat	27 676 800
Imported	21 264 200
	48 941 000

In the home supply the estimated weights of cattle and sheep exported are included in the above figures. After deducting the quantity of meat exported, the quantity consumed was:

	Cwt.
Home-fed meat	27 326 800
Foreign and Colonial	20 928 400
	48 255 200

This equals 118 ½ lb. per head of the population (45 600 000).

In many countries population is increasing more rapidly than the herds and flocks. The high prices of fat stock now ruling are likely to be maintained for some time to come.

Well-bred herds and flocks in the hands of experienced farmers are as safe and remunerative an investment at the present time as can be found in connection with the land, and they continue to be the sheet anchor of farming.

1090 - **The Origin of the Industry and Trade of Cold-Stored Meat, especially in the Argentine Republic.** — *Annales de la Sociedad Rural Argentina*, Year XLVIII. Vol. XLVII, No. 1, pp 52-60. Buenos Aires, January-February 1913.

The cold storage of meat, which is now recognized as one of the most important industries of the world and which supplies material for a most active trade between the various continents, is of quite recent origin, having arisen within the last thirty years.

Before entering into the causes of the development of this industry, the writer examines two interesting kindred subjects, one of which is the decrease of live stock in Great Britain during some decades previous to the introduction of cold-stored meat, and the other the canned meat industry in Australia.

It was naturally the demand for meat which caused the discovery of means of increasing the supply on the English markets. There are no official statistics available as to the numbers of cattle and pigs in the United Kingdom before the middle of the nineteenth century, the first live-stock census having been taken in 1876. Nevertheless, according to Mulhall's fairly exact calculations for the decade 1851 to 1860 during which meat began to be imported into the United Kingdom, the average production of beef, mutton and pork for England, Scotland and Ireland was 900 000 tons, corresponding to 77 lbs. of meat per inhabitant. There was besides an importation of 43 300 tons of live stock which brought up the total to 81.4 lbs. per head. During the decade 1861-70 the average production rose to 1 020 000 tons and the imports to 129 000 tons. In 1882 the production was 1 073 000 and the imports rose to 643 700 tons, corresponding together to an average of 121 lbs. per inhabitant per year., of which quantity 46 lbs. was imported. The meat produced in England in 1882 consisted of 680 000 tons of beef, 300 000 tons of mutton and 93 000 tons of pork. The imports were chiefly living cattle and sheep.

The following figures of the number of animals slaughtered in Great Britain — oxen, sheep and pigs, — give an idea of the decrease in the numbers of cattle between 1867 and 1880 and of the return to the figures of 1867 by means of the importation of animals and meat between 1880 and 1910.

1851 to 1853	40 676 000	(Mulhall)
1867	46 770 524	(official figures)
1880	42 974 261	»
1910	46 491 521	»

As for the importance of the quantities of meat imported into the United Kingdom during the last fifty years, it is sufficient to note that during the five years 1861-65 the average amount of imported fresh beef, mutton and pork was only about one tenth of a pound per inhabitant, while the introduction of cold-stored meat in 1880 raised the average between 1881 and 1885 to 3.5 lbs., between 1891 and 1895 to 12.4 lbs., and between 1906 and 1910 to 28 lbs.

In Australia and in New Zealand about the year 1870 the numbers of live stock had increased very rapidly whilst the human population was still very sparse; the consequence was a fall in the prices of stock. It was between 1868 and 1879 that the trade in cold-stored meat sprang up, namely after the experiments of Harrison and Mort in Australia, and of Tellier and Carré in France, and after the fortunate voyage of the steamship "Strathleven" had removed every doubt as to the practical application of the process. But before the trade in cold-stored meat had commenced, the exportation of canned meat had already developed in Australia. The first to use glazed earthenware vessels for preserving meat was a Frenchman, Appert, and the first mention of his method was made in 1809. Before his time glass vessels were used and afterwards iron ones (Heine's English patent No. 3310 in 1810). Tin cans were introduced in 1850 by the brothers Pellier. Liebig's methods also were adopted by the meat industry in Australia.

In 1850 there were 110 factories which boiled down meat for tallow. The sheep thus treated were 800 000 and the oxen 73 000 and the product export amounted to nearly 11000 tons. In 1851 the industry increased further and it is probable that 10 per cent. of the Australian sheep were destroyed by this ruinous process. The same system was adopted in New Zealand to utilize the surplus of stock.

The United States of America were the first to start the trade in meat refrigerated during the journey. The first exportation of chilled beef from the United States began in 1870. At the end of 1880, when the first cargoes of Australian mutton arrived, Great Britain had already imported about 120 000 tons of fresh meat from North America.

Captain Nuflo Chaves introduced the first sheep into the Argentine Republic in 1550; the first cattle (seven cows and a bull) were imported by Juan de Salozer y Espinosa. The Spanish colonists settled along the Rio de la Plata and Juan Torre di Vega y Aragon, recognizing the favourable conditions of the pampas for live stock, divided among the colonists 4000 head of cattle and 4 000 sheep. The animals multiplied rapidly and soon exceeded the requirements of the scarce population, which then already began thinking about the possibility of some exportation, limiting it however to hides. In 1616 the ship "Nuestra Señora de Refugio" left Buenos Aires with a cargo of 1281 hides worth 10 248 reals (about £270). In 1794 Don Manuel José de Labarden imported from Spain into one of the provinces of Rio de la Plata 10 Merino rams and 20 ewes and in 1813 Mr. Henry Lloyd Halsey imported 100 head of this breed into the province of Buenos Aires. The first importation of English breeds was effected in 1825 with thirty Southdowns and the first importation of Lincolns took place in 1840.

In order to utilize commercially the enormous herds and flocks living almost wild in the Plata lands, factories for the salting of meat were established. The first was started in 1717 and the exportation of salted meat began. In 1822 the value of the hides, tallow and wool exported amounted to about £650 000 per annum; as for salted meat, 35 220 tons passed through the Buenos Aires Custom House in 1862 and 42 397 tons in 1866. The importance of this industry is such that the number of animals treated in the "saladeros" is more than double that of those slaughtered for cold storage.

The first importation of Shorthorn cattle was effected by Don Juan N. Fernandez in 1865. Then followed the constitution of the "Rural Argentine Association", which marks the beginning of a series of intelligent and successful efforts for the promotion of a well organized animal husbandry. About that time the importation of pure bred animals of the best breeds began to be practised on a large scale with the object of improving the local breeds.

In 1868 the Argentine Government offered a prize of about £ 1600 for a practical method of preserving fresh meat. In 1877 the Government suspended for five years the export duties on fresh meat and in 1882 abolished them finally.

The following figures taken from four official Argentine live stock census returns give an idea of the progress of stock breeding in that country.

Year	Cattle	Sheep
1875	13 337 862	57 501 261
1888	21 963 930	66 701 097
1895	21 701 526	74 379 562
1908	29 116 625	67 211 754

In 1874 the exportation of live animals began, and by the end of 1879 about 1 000 000 head of cattle and 165 000 sheep had been exported. The attempt made in 1876 by Charles Tellier with the steamship "Frigorifique" gave perhaps the first impulse to the creation of cold-storage establishments. The success of the "Strathleven" caused a greater stir and lastly the steamer "Paraguay", in 1883 with a cargo of cold-stored meat for the Old World began the great exportation of fresh meat from the Argentine. This has led to a notable increase in the prices of live stock and has been a powerful stimulus to the improvement of the local breeding.

The exportation of fresh meat from Argentina was always mainly directed to the United Kingdom.

The "Financial Times", in reviewing the report on the trade of cold-stored meat in the United Kingdom during 1912, notes an increase in the exportation from Argentina and states that the South American products amount to 64 per cent. of the meat consumed in England. It adds that probably this trade will increase still further in 1913 and that the prices will be higher than those of 1912. The figures published in England for 1912 show an importation into the United Kingdom of 1 580 648 quarters of frozen meat, with an increase of 170 492 quarters over the previous year. Into the same country 2 220 697 quarters of chilled beef were imported, with an increase of 69 531 quarters over the preceding year.

The exportation of frozen and chilled meat from the Argentine Republic during 1912 amounted to:

Frozen carcases of mutton	3 584 927
Frozen quarters of beef.	2 086 780
Chilled quarters of beef	2 269 474

On the whole the exports were higher than in 1911. There was an increase in the quantity of beef and a decrease in that of mutton. The number of animals slaughtered in the Argentine "frigorificos" during 1912 was 1 417 213, and that of those worked up in the "saladeros" in the same time was 116 900, thus distributed: Rios, Argentina and Uruguay 36 300; Montevideo, 47 000; Frontera, 19 600; Rio Grande, 14 000. The exportation of live cattle in 1912 was 261 416 head, or 77 304 more than in 1911.

The export of "tasajo" (jerked beef) in 1912 was about 8 600 tons. The exports of frozen and chilled beef during the month of January 1913 exceeded those of the corresponding month of 1912, while the amount of mutton exported was much less.

The numbers of animals slaughtered at the "frigorificos" during the month of January 1913 were as follows:

Compañia Sansinena de carnes congeladas	30 360
The River Plate Fresh Meat Co	13 573
Las Palmas Produce Co.	12 407
La Blanca	19 859
The La Plata Cold Storage Co.	28 075
The Smithfield and Argentine Meat Co.	7 444
Frigorifico Argentino	8 627
La Prigorifica Uruguaya	4 472
Frigorifico Montevideo	5 263
	130 080

NE-MAKING

1091 - **Good Wine and Bad Cellars.** — MATHIEU, L. in *Revue de Viticulture*, Year 20, Vol. XL, No. 1022, pp. 74-80. Paris, July 17, 1913.

After having reviewed the causes of the bad conservation of fine wines in the modern cellars of large towns subject to high temperatures and tremors, causes which act by favouring the multiplication of bacteria, the writer points out the real remedy for this state of things: To ensure the conservation of wines it is sufficient to prevent their being the seat of bacterial diseases.

This result may be obtained in various ways:

1. By bottling them free from bacteria, either by a sterilizing filtration or by a perfect clarification; but the contamination of the inside of the glass, of the corks, and even of the air in contact with the wine during the operation of bottling, must be guarded against.

2. By rendering the wine unfit for the multiplication of bacteria by such a high alcohol content as to be antiseptic; this is the case with liqueur wines which are brought up to at least 17 or 18 per cent. of alcohol,

but this process is not practical for wines for ordinary consumption nor for those of great vintages.

3. Wines may also be kept at temperatures lower than those favourable to the vitality of germs, for instance below 10° C., but this is a solution which can only be adopted by people who have such cool cellars.

4. Lastly the bacteria which are in the wine may be killed, so that one becomes independent of exterior conditions and of the constitution of the wine. In this manner any wine whatever, as well as milk, broth and the most perishable food stuffs may be kept by destroying the bacteria and preventing new invasions taking place by contact with the air. As wine is kept in well closed bottles, it is enough to warm the corked bottles to a temperature of 65° or 70° C. in a water bath in order to sterilize at the same time the wine, glass, cork and air, if there is any in the neck of the bottle; in this way an indefinite preservation is ensured.

The experience of about half a century has recognized the value of pasteurization; experiments carried out at Bordeaux by M. Gayon have established with precision the conditions of temperature to be reached; numerous tests conducted at the Beaune Station have proved that the finest wines may be pasteurized without hesitation provided the operation be carried out with due caution.

This operation is very easy; and it does not require much or costly plant. It has been objected by some that the process gives a taste as of cooked wine and that it causes a certain amount of breakage. No doubt some such accidents do take place with inexperienced hands, but now-a-days it is very easy to pasteurize bottles even on an industrial scale.

The bottles are filled with wine and then well corked. They are then kept for a month on their sides, after which they are heated in a water bath, taking care not to plunge them into warm water if they are cold or viceversa. The temperature of the water should not be above 40 or 45° C. according to the initial temperature of the bottles. The corks must be fixed by a clip, by some string or wire, because during the process of warming, the wine expands and the pressure would cause the corks to fly out.

As soon as a thermometer placed in a bottle of the same shape and capacity as the bottles containing the wine, but filled with water, shows a temperature of 65 or 70° C., the bottles are to be removed from the bath. They are allowed to cool in the open, standing and not on their sides, or still better they are cooled in a tub by a current of water, taking care at first to mix cold water with the warm water poured into the tub before placing the warm bottles into it. Care must be taken also that the necks of the bottles be well out of the water; otherwise the contraction of the wine on cooling would cause water to enter through the fissures of the corks.

A temperature of 65 to 70° is sufficient to lower the vitality of all the germs likely to develop in wine and consequently it is sufficient to ensure the indefinite conservation of the wine under any conditions. The wine may be sent any distance in the holds of ships, under tropical climates; it may be sent to the colonies and kept there, it may be carried on pack animals during the hottest days without any risk of deteriorating. That is to say it may be kept equally well in any cellar with heating apparatus and gas or in the neighbourhood of the greatest traffic without suffering in any way ; it will only grow old more rapidly.

1092 - **The influence of Some Elliptical Yeasts on the Constitution of Wine and other Fermented Liquids.** — VENTRE, JULES in *Annales de l'Ecole Nationale d'Agriculture de Montpellier*, New Series, Vol. XIII, Part I, pp. 19-67. Montpellier, July 1913.

This paper is a study of the influence of certain ellipsoidal yeasts on various natural media, such as the juice of black and white grapes of different concentrations of sweetness. The writer has made use of the four most important yeasts of the southern distiicts, namely :

For red wines: 1) the yeast of Beaujolais from the vineyards of Moulin à Vent , 2) the yeast of Burgundy from the vineyards of Romanée-Conti, 3) the yeast of Médoc from the vineyards of Margaux.

For white wines : the yeast of Verzenay (Champagne) from Chandon.

According to the writer's preliminary experiments, these types may be considered quite fixed.

In the products of fermentation he has determined all the elements that can be separated by reliable methods : Alcohol, fixed and volatile acidity , dry extract and its principal constituents (glycerine, succinic acid etc.) He gives an account of the methods of analysis adopted. In determining the influence of the ferments on the acidity he has made researches on the constitution of the fixed acidity. By taking all these partial results together the writer was able to deduce conclusions showing at what stage the yeast was able to influence the medium in which it grew and give it a special character varying with the different species studied.

These conclusions are of theoretical and practical importance.

From the theoretical point of view they may be summarised as follows:

1. In any particular medium, yeasts do not all act in the same way, as regards either taste or chemical composition.

2. Some of them show a power of attenuating comparable to that of certain brewer's yeasts. This attenuation particularly that occuring on the yeasts of Verzenay, is concerned chiefly with the glycerine and succinic acid.

3. The Médoc yeasts always produce a larger dry extract than is found in the other media, but without any reducible matter being left unutilized.

4. Certain yeasts, those of Médoc in particular, have a special tendency to produce volatile acids.

5. The production by certain yeasts of volatile acids in considerable quantity is not connected with the presence in the liquid of pathogenic germs, such as that causing "tourne," which consume a portion of the sugar to produce volatile acids, thus reducing the alcohol content. It is therefore necessary to assume the presence of a distinct biochemical factor.

6. The fixed acids are attacked in different ways and to different degrees by various yeasts. Even tartaric acid, which is usually considered to be resistant to such decomposition, was changed by these organisms. Malic acid, however appears to be the most easily attacked and in a

specific manner by each yeast. The yeast of Verzenay and Médoc are less active with this acid than the others. This accounts for the fact that the products from musts treated with Verzenay yeast have a more acid taste than those treated with the Beaujolais organism. When tested chemically, these products do not show any difference in their total acidity.

7. The quantity of ether produced in a wine appears also to indicate a separate biological process. In fact there is not always absolute correspondence between the quantity of volatile acid determined and the quantity of ethers formed. The Verzenay product shows also greater proportion of ether than that of the other products.

From the point of view of the analysis of the wines, very interesting conclusions can be drawn.

A natural wine treated with the Verzenay organisms and allowed to ferment a short time would be spoilt and attributed to adulteration by the addition of alcohol for the relation between the weight of alcohol and extract would be too great. In fact though the experiments on red wines made by the writer cannot be considered as typical of the entire vintage, they give results very similar to those of the rose-coloured wines. In this case if the ratio alcohol to extract is taken as 4.6, it is found that in the experiments of 1911 all the wines would be considered as having had 5 to 27 per cent. of alcohol added to them.

From the practical point of view. A knowledge of the peculiarities of each specific yeast opens up a new field for the application of yeasts in wine making. Considering only the differences in the organoleptic characters given to the same media by the yeasts of Verzenay and Beaujolais, there is no doubt that in warm countries where a low acidity is the general rule, it would be valuable to use a yeast, say that of Champagne which would preserve the maximum of the products. In cold countries, where the acidity is great, it would be necessary to add a yeast which decreases the acidity.

The writer proposes to carry on researches with a view to determining the exact condition for using these yeasts in wine-making.

1093 - **Alcohol from the Fruit of the Strawberry Tree (*Arbutus Unedo*).** - SANI, GIOVANNI in *Atti della Reale Accademia dei Lincei, Rendiconti,* Vol. XXII, Part 12, 1st Half-year, pp. 881-885. Rome, June 15, 1913.

BREWING AND DISTILLING

According to the writer there are few forest trees that could give as high and constant returns as the strawberry tree if it were systematically cultivated and utilized. The analysis of its ripe fruit shows an average sugar content between the years 1905 and 1913 of 18.83 per cent. The experiments here mentioned were carried out in the laboratory of agricultural chemistry at the R. Istituto Superiore of Perugia. On December 5, 1905, 330 lbs. of fruit were crushed in a vat. Fermentation set in on January 7 and ended on the 22nd of the same month. *Saccharomyces ellipsoideus* was the prevailing ferment, but there was also some *S. apiculatus.* The liquid expressed from the mass contained 10.5 per cent. of alchool. On distillation it yielded an alcohol possessing a delicate taste and the perfume of the fruit and which improved with age.

In successive experiments many hundredweights of fruit were fermented, the resulting wines containing from 9.15 to 9.75 per cent. of alcohol. The results of the analysis of one of the wines obtained by pressing the fermented mass are given in the following table. By partial rectification the writer obtained alcohol at 85°, which on being analysed gave the results given in the following table. According to the writer the preparation of this alcohol on a large scale could be carried ont in favourable conditions.

Wine made from strawberry tree fruit.

Specific gravity	1.030	
Alcohol	9.15	per cent.
Total acidity	14.1	per thousand
Bitartrate	3.96	
Tartaric acid	0.06	»
Volatile acidity	0.55	
Tannin	0.781	»
Dry extract	102.20	»

Alcohol from strawberry tree fruit.

Acidity (as acetic acid)	gm. 0.132 gm. per litre
Ethers (as ethylacetic ether)	» 1.757 » » »
Furfurol (with acetate of anilin and floroglucin)	present but not determinable by weight.
Methylic alcohol (Denigès method)	present
Free hydrocyanic acid	nil.
Combined hydrocyanic acid	»
Fusel oil (Röse's method, increase of volume, difference from pure alcohol 0.35 gm.)	gm. 2.321 gm. per litre calculated by Sell's tables.

'ARIOUS

1094 - **The Present State of the Industry of Esiccating Forage.** — MEYER, D. in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 61, pp. 555-557. Berlin, July 30, 1913.

Drying of Potatoes. — The methods adopted in practice for drying potatoes use hot gases, steam or hot oil. The first are especially employed for drying sliced potatoes and the others for potato flakes. For drying by means of hot gases, the esiccators used are those on the drum, trough, and sometimes on the hurdle system, whilst for steam or oil drying only roller esiccators are used (1).

The cost of drying by these various methods varies according to the size of the plant and the duration of the work. The longer this is, the lower the total expense per cwt. of potatoes. In the second place the cost is determined by the output of the plant, which in its turn depends chiefly upon the consumption of coal. For this reason and especially in the manufacture of flakes, motor engines that work well and at the same time supply the steam to be used in the drier must be used. In drying by means of the conbustion gases a good utilisation of their heat must be attained. Besides, the cost of drying potatoes varies according to the starch content of the same potatoes and the water content of the dried potatoes. The greater the starch content of the potatoes, the less moisture is there to evaporate and the greater the quantity of dried potatoes turned out in a given time. With a good plant the average cost of drying is 4.18 *d* to 4.78 *d* per cwt. of raw potatoes if the gases of combustion are used, and 5.38 *d* to 5.97 *d* per cwt. with steam.

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(1) For a detailed description of the various methods of esiccating, see the writer's work *Handbuch der Futtermittel-und Getreidetrockmung*. Leipzig 1912, (Jäneke).

The utilization of raw potatoes by means of esiccation depends on the starch content of the tubers, the cost of drying, and the price of the dried potatoes when they are not consumed on the farm itself but get sent to the market.

As dried potatoes are often used instead of foods rich in carbohydrates such as maize, barley and the like, their price must be considered in connection with that of these foods on the market. In the feeding of horses, their price must be compared to that of oats. At a price of 7*s* 5.65*d* per cwt. of dried potatoes and a cost of 4.78*d* for drying, the writer considers that one hudredweight of fresh potatoes containing 16 per cent. of starch gets paid 1*s* 4.85*d*; if they contain 18 per cent. it gets paid 1*s* 7.48*d* and 1*s* 9.8*d* when they contain 20 per cent. At a price of 8*s* 5.6*d* per cwt, the prices are respectively 1*s* 7.84*d*, 1*s* 10.71*d* and 2*s* 1.22*d*.

In selecting the method of drying to be adopted, the economical conditions and the uses to which the product is destined must be considered. The writer advises plant for the production of flakes, if potatoes are the only crop to be worked up and if they are to be used chiefly for feeding to pigs, also if the plant is connected with a distillery or starch works or dairy and if the quantity of potatoes is not very considerable. If on the other hand besides potatoes, beet leaves, other forage or cereals have to be esiccated, and if the product is to be fed to horses, cattle and sheep it will be preferable to select a plant for the production of dried slices. As for the dimensions of the apparatus, it must be remembered that a large plant is not profitable unless the time during which it is worked is fairly long, namely from 150 to 180 days. In the case of cooperative drying plant the first thing to be done is to make sure of a sufficient quantity of potatoes to be dried. The writer considers that the high cost of cooperative drying is due to the fact that the time during which the plant works is too short.

When the quantity of potatoes to be dried is not enongh to keep an independent plant going, recourse may be had to one attached to a distillery, dairy, etc. Before deciding, it is necessary to consider carefully all conditions.

The writer is of opinion that potatoes which are to be fed shortly after the harvest to cattle, sheep and pigs should not be dried. On the contrary, those destined for horses shonld always be dried. Potatoes stored up to the end of the winter suffer a loss of substance amounting to 8 and even 10 per cent, and if they are not fed to the live stock until the spring or summer the loss reaches as much as 25 per cent. Supposing the prices of potatoes to be 1*s* 6*d* or 2*s* per cwt. the loss would be 4 ½ *d* or 6 *d* per cwt. The loss caused by storing is about the same as the cost of drying. When the prices of potatoes are low the cost of drying is not less than that of ensilaging, but drying affords the possibility of utilizing completely all the nutritive matter, and in years of abundant crops it saves the farmer from having to throw on the market large quantities of potatoes at a low price or to feed them wastefully to his stock.

Esiccation of Beet leaves. — Among the secondary products and residues of the cultivation of beets, the leaves present the greatest interest as to esiccation and this because their ensilage and their subsequent feeding to live stock present several drawbacks, amongst which particularly the loss of nutritive matter. This method of using them entails a considerable loss of money, as may be seen from the following figures: From 1906 to 1910 in Germany the acreage devoted every year to beets averaged 1 113 700 acres. Admitting the amount of leaves produced per acre to be 10 tons, the total crop would be 11 137 000 tons. If it be considered that two-thirds of this amount is ensilaged and that during this process one-third of the dry matter is lost, the loss amounts in round numbers to about 2.5 million tons of fresh leaves, or calculating that 5 tons of fresh leaves produce 1 ton of dried leaves, the loss amounts to about half a million tons of dried leaves, worth about £1 200 000.

The esiccation of beet leaves is carried out chiefly in drum esiccators and sometimes also in hurdle esiccators. The various models of the former differ considerably from each other in the construction of the interior and the gradual passage through the drum of the stuff to be dried. The progress achieved during the last ten years in this field becomes evident if the composition and aspect of the product be considered. Formerly the dried leaves were hard and brittle, while now according to recent methods the dried leaves have preserved their original green colour, they are soft, elastic, cleaner and possess a starch va'ue of 35 to 38 per cent, instead of 25 to 28 as formerly.

The cost of drying varies, as it does with potatoes, according to the size of the plant and the duration of the work, which, considering the great losses which would be caused by rotting, cannot be extended at will, but averages 70 to 80 days. On account of the shorter working period, the interest and amortization of beet leaf drying plant is fairly high. Whilst in potato drying about 2.39 to 3.59 *d* per cwt. are to be debited as general expenses, in beet leaf drying 5.96 *d* have to be debited. The writer believes that a notable diminution of general expenses is possible when the plant can be used also for other foodstuffs. Further the cost of drying is influenced also by the efficiency of the plant and by the amount of fuel consumed. If coal is used about 6.56 *d* to 7.15 *d* is required per cwt. of dried leaves. Using lignite the cost of fuel is less. Again the cost of drying varies with the amount paid for labour and the use of teams, which may be set down at 4.46 to 5.96 *d* per cwt., and with the moisture content of the fresh and dried leaves. If the leaves are dried immediately after the harvest, the writer states that for the production of 100 lbs. of dry leaves containing 12 to 15 per cent of water, from 550 to 600 lbs. of fresh leaves are required. If on the contrary the leaves are left for a certain length of time in the field only 350 to 500 lbs., or an average of 450 lbs., are required to produce 100 lbs. of dried leaves. The question as to how far this partial drying of the leaves may be carried without incurring too heavy a loss depends naturally upon the weather.

The cost of drying in an installation devoted exclusively to beet leaf drying ranges from 1*s* 5*d* to 1*s* 7*d* per cwt. of dried leaves. If other forage is dried also the cost diminishes.

As for the profitableness of drying beet leaves, the writer considers first class beet leaves to possess about the same value as the best meadow hay. If the economic value of the latter be taken at 2*s* 6*d* per cwt., the value of the leaves, after deducting 1*s* 6*d* for the cost of drying, is 1*s*.

Assuming 450 lbs. of leaves partially dried in the field to be necessary to produce 100 lbs. of dried leaves, the cwt. of the former would be worth 2.63 *d*, which must be considered as a favourable price. In view of this, and of the disadvantages attendant upon an excessive use of silage, an extension of the practice of drying beet leaves is justified, especially in breeding farms in which ensilage is often injurious. In milk farms on the contrary, where milk and dairy produce command only medium prices, the use of dried leaves is, according to the writer, of limited advantage because the successful production of milk depends only very partially upon the feeding of concentrated foods. Nevertheless here also esiccation allows of a better utilization of the beet leaves.

Drying of sugar-beet and mangold slices.—In this field the technique of esiccation has not achieved any considerable progress recently. The number of sugar factories which have erected drying installations has undoubtedly increased of late, which speaks for the recognition of the importance of the drying of the slices.

The market price of mangold slices was, during recent years, higher than their economic value, which was 3*s* 9*d* to 4*s* per cwt. The price of sugarbeet slices stood also higher than their nutritive value.

In conclusion the writer speaks of the drying of yeast, a subject which has already been treated in detail in thus Bulletin (1).

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(1) See *B*. May 1913, p. 692: "The Development of the Dried Yeast Industry in Germany", by Dr. F. Hayduck.

PLANT DISEASES

GENERAL INFORMATION.

SLATIVE ADMINI-
RATIVE
ASURES

1095 - **Proclamation Regarding the Importation of Potatoes into Western Australia.** — Extract from the *Government Gazette* of November 22, 1912.

The Governor revokes the Proclamation published on April 19, 1912, and makes the following regulations:

The introduction into Western Australia of any potatoes the product of, or directly or indirectly from, the State of Queensland is prohibited absolutely.

The same prohibition extends to potatoes coming directly or indirectly from the States of New South Wales, Victoria, South Australia and Tasmania, except in accordance with regulations made by Order in Council under the "Insect Pests Amendment Act, 1898".

The ports Eucla, Esperance, Hopetoun, Fremantle, Perth and Geraldton and all ports north of Geraldton are to be the only ports of entry for potatoes and potato bags.

It is absolutely prohibited to bring potatoes, or second-hand potato bags, from any other portion of Western Australia into all that part of Western Australia which is bounded by a line commencing at the sea-coast at Rockingham, and extending along the north boundary of Rockingham and thence extending in a straight line to the south-west point of Mundijong townsite, and thence in a straight line eastward to the most southerly point of Beverley townsite, and thence eastward to the 119th degree of East longitude, and thence south along the said meridian to the sea-coast, and thence following the sea-cost westward and northward to the starting point.

With the consent in writing of the Minister for Agriculture, seed potatoes, the property of the Department of Agriculture may be brought into the area described.

The introduction is prohibited into Western Australia, from the States of New South Wales, Victoria, South Australia, Queensland, and Tasmania, of second-hand bags that have been used for the carriage of potatoes, either empty or containing goods. Empty bags may, however, be introduced at the port of Fremantle, if disinfected according to regulations made under the Act of 1898.

This Proclamation shall have operation and effect on and from the date of its publication in the *Government Gazette* of November 22, 1912.

1096 - **The Obligatory Destruction of the Stinking Mayweed *(Anthemis Cotula)* in the District of St. Leonards, Tasmania.** — Black, R. A., Federal Quarantine Officer (Plants, etc) — *The Agricultural Gazette of Tasmania*, Vol. XXI, No. 5, pp. 165-169 + 1 plate. Hobart, May 1913.

At the request of the Municipal council of St. Leonards, the stinking mayweed (*Anthemis cotula* L.) was proclaimed on the 27th of March 1913 a noxious weed for its municipality, under section 6 of "the local Government Act 1906" (6 Ed. VII, No. 31) It has also been proclaimed for several shires in Victoria and New South Wales.

This weed grows in profusion on roads where either side is grassed. From experiments carried out in America, its seed has been found to be viable after 25 years. It was imported into Tasmania mixed with farm seeds and is a prohibited weed under "The Federal Quarantine Act, 1908", which means that the importation of the plant or its seed from any part of the world into Australia is forbidden under a severe penalty. It is now incumbent upon the Municipal Council of St. Leonards to take action for the eradication of this weed. Every occupier of land who does not destroy the stinking mayweed on his property is liable to a penalty not exceeding £ 20. Any person who knowingly sells hay, straw, or grass seed or any kind of grain containing seeds of *Anthemis cotula* L. is, liable to a penalty of not less than forty shillings nor more than twenty five pounds.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

1097 - **Floral Abnormalities in Maize, which appeared spontaneously in France in 1912.** - Miège in *Bulletin des séances de la Société Nationale d'Agriculture de France*, Vol. LXXIII, No 4, pp. 292-295, 3 figs. Paris, April 1913.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN

Abnormalities in the flowers of maize have been so numerous in some districts of France as to have assumed the proportions of a calamity.

In some cases, female spikelets have been substituted for the male spikelets of the base or the summit of the ramified panicle; in others the lateral stems have been transformed into mal-formed bunches; while complete metamorphosis has resulted in a single terminal ear of irregular shape with indented seeds separated by the glumes of persistant female flowers.

This metamorphosis has often been associated with abundant tillering, insufficient ripening, as well as reduction or abortion of the seed.

In spite of the removal of abnormal stems during hoeing, those remaining at harvest formed two-thirds of the crop.

The disease seems to occur independently of any traumatism; and appears due to a disturbance of the physiological equilibrium, in the form of an excess of nutrition due to a large amount of nitrogen, and especially to abundant rainfall. The correctness of this hypothesis seems to be proved by a similar observation made by the writer. On soil which had been continuously cultivated for 12 years without being manured, the maize crop showed every year the opposite modification to that just mentioned, *viz* the female flovers were converted into male flowers. This kind of sexual retrogression appears to be the result of a deficiency in the food supply. The regulation of the latter is the best means of diminishing the frequency of these abnormalities.

1098 – **Studies on the Water Core of Apples.** — O' GARA, P. J in *Phytopathology*, Vol. 3, No. 2, pp. 121-128 + 2 figs Baltimore, 1913

Water core is a disease which occurs more or less generally in all the districts of the United States, particularly in the arid and semi-arid parts. It has also been recorded in Europe, Asia and Africa.

The writer has done considerable work on this disease during the past few years. Some European writers have held that water core is caused by bacteria, although others have shown that the trouble is not due to any parasitic agency. All the methods known to modern bacteriology, especially those used in the study of ultra-microscopic organisms, have failed to show the presence of any organism. The inoculation experiments of the writer afforded no positive results.

The affected apples have hard watery areas extending outwards from the outer edges of the seed cavities. In the beginning stages, the first appearance of water core is in connection with the vascular system. Later the seed cavity usually contains liquid and the hard inner membrane of the carpels is cracked and covered with hair-like growths, the fruit has a somewhat sweetish fermented flavour, and the watery parts contain more sugar and less acid than the normal or unaffected parts. It is during the later stages of the disease that fungi and bacteria are present. *Alternaria* sp. is a common intruder and produces a serious core rot. The *Alternaria* infection may be prevented by the application of Bordeaux mixture.

The most prominent factors inducing water core are: 1) excessive or strong vegetative growth, especially in young trees just coming into bearing; 2) high cultivation and the consequent retention of moisture in the soil; 3) excessive precipitation or irrigation shortly before the maturity of the fruit, if followed by great differences in the day and night temperature and atmospheric humidity (the fruits most affected are those farthest out on the terminals and those on the south or south-west sides of trees); 4) severe pruning shortly before the ripening period, or defoliation by disease or otherwise; 5) frosts; 6) rapid conversion of starch into sugar.

In a heavily irrigated orchard, 90 per cent. of the fruit became water-cored, and in one which was severely pruned during the latter part of August nearly all the crop was similarly affected, while in neighbouring orchards, growing under the same conditions as regards the soil and the variety cultivated, 5 per cent. and none of the fruit was respectively attacked.

In order to prove that it is universally true that water core is more liable to occur in exposed fruits, the writer had a large number of apples picked from the south and south-west parts of trees, and others taken from unexposed positions. In the former case, 90 per cent. of the fruit showed water core, while less than 5 per cent. were water-cored in the latter case. The degree of alteration is in proportion to the exposure of the fruit, to extremes of temperature and humidity. Usually, water-cored apples have a much higher colour than those not affected.

Under proper storage conditions, water-cored fruit, unless badly diseased, will entirely recover. This will be the case where no liquid fills the seed cavities, and if the fruit is placed in a cool even-temperatured place (not cold storage). This shows the non-parasitic nature of the trouble. Thus, as soon as it is found that apples are becoming water-cored, they should be immediately picked and placed in proper storage.

In an experiment, 1000 boxes of Newtown apples, of which fully 90 per cent. were water-cored, were stored for about three weeks. At the end of this time, the fruit was again examined, and scarcely 1 per cent. were still affected. The only cases not fully recovering were those in which the seed cavities had become filled with liquid.

BACTERIAL AND FUNGOID DISEASES.

FUNGI

1099 - **Pure Cultures of *Phytophthora infestans* De Bary, and the Development of Oospores.** — PETHYBRIDGE, GEORGE H. and MURPHY, PAUL A. in *The Scientific Proceedings of the Royal Dublin Society*, Vol. XIII (N. S), No. 36, pp. 566-588 + plantes XLV-XLVI. Dublin, 1913

In the case of *Phytophthora infestans*, the parasitic fungus which causes the potato blight, the study of the life-history of the parasite has failed to reveal with any certainty any stage in which sexual organs are produced, although many of its allies amongst the Peronosporaceae have been shown to produce such organs.

The writers consider that, in studying the life-history of a parasite, it is not sufficient to obtain the details from the latter as it grows upon its host, but the fungus should be grown as a saprophyte on a suitable artificial medium as it is possible that, under these conditions the organism may show stages in its cycle of development which are not produced during its career as a parasite.

An account is given of previous experiments undertaken for the purpose of obtaining suitable substrata for *Phytophthora infestans*, and a detailed description of the pure cultures and the technique employed in the several cases follows.

In some pure cultures, *P. infestans* did not form sexual organs, in others it formed sexually produced spores, or oospores; thus the work of Clinton was confirmed. Whether, however, these spores are *strictly speaking* formed sexually or not — that is whether an actual process of fertilization occurs or not — cannot be decided at present. Clinton (1911) found that in the absence of antheridia, the oogonia did not do more than develop oospheres, but Messrs. Pethybridge and Murphy observed that in at least one-third of the cases examined under such circumstances, both in Clinton's medium and their own, oospores were produced; they looked upon such spores as having been formed parthenogenetically. These spores resemble those formed when antheridia are present, except that in many cases their walls appear to be slightly less thickened.

Even when antheridia are present, it is difficult to see how the oosphere can be fertilized, for it is completely shut off from the antheridium by the funnel-shaped base of the oogonium and no signs of a fertilization track have been observed. It is of course possible that a union of the male and female elements may occur soon after the entrance of the oogonial incept into the interior of the antheridium, but if fertilization occurs at this stage, it occurs *before* the formation of the oosphere, which would represent an unusual state of affairs.

Clinton was not able to trace the points of origin of the oogonia and the antheridia, but states that they seem to arise on separate hyphae. The observations of the writers show that this is actually the case, and moreover they explain Clinton's difficulty in finding antheridia except such as were in contact with oogonia which were already well on in their development. Clinton states that the antheridia observed by him often show the *superimposed* "oogonial thread", but the writers find that this structure, which is in reality the lower part of the oogonium itself, is actually within the antheridium and not superimposed upon it.

Whether the fungus produces oospores in the potato plant or not, will have to be settled by further research. The writers (like, the other investigators) have found thick-walled spores in the tissues of various parts of the potato plant which have been destroyed by *P. infestans*; these may possibly have been such bodies, although as a rule they appear to be smaller than the spores obtained in pure cultures. Many of them too have been seen to be surroundend by a kind of halo of brownish material which may possibly be the remains of the oogonium wall. If such bodies are produced in the potato-plant, they would doubtless find their way to the soil and probably play an important part in keeping the fungus alive over the winter, and in causing infection of the potato crop during the following season.

RESISTANT PLANTS

1100 - **Factors affecting Susceptibility to Disease in Plants.** — SPINK, G. T. in *The Journal of Agricultural Science*, Vol. V, Part 3, pp 231-247, plate VII. Cambridge, June 30, 1913.

From experiments on the effect of mineral starvation on species of *Bromus*, Marshall Ward concluded that decreased susceptibility to rust was only caused by the lack of sufficient food in the host plant on which the rust fungus could feed.

In order to study the question more closely, the writer made some experiments under different conditions of nutrition:

a) With wheat plants grown in nutritive solutions and attacked by mildew (*Erysiphe graminis*).

b) With the same wheat grown in boxes of soil.

c) With cultures in nutritive solutions, using wheat plants of two varieties with different powers of resistance, and both inoculated with the uredospores of yellow rust (*Puccinia glumarum*).

d) With pot cultures of the same wheats.

e) With pot cultures of wheat attacked by *Erysiphe graminis* carried out on the farm of the Royal Agricultural Experiment Station at Woburn.

f) With experiment plots of wheat and barley at the same Station. The cereals were attacked by mildew and by *Puccinia graminis*.

The conclusions which can at present be drawn from these investigations may be shortly summarised as follows:

I. Susceptibility to mildew and yellow rust in wheat, and to mildew in barley, is increased by providing the plants with large amounts of available nitrogen; ammonium sulphate and sodium nitrate seem to be equally effective in this direction.

II. Mineral manures especially potash salts, on the contrary decrease the susceptibility to disease, but cannot counteract the effect of large quantities of nitrogenous manures.

III. Plants which are semi-starved as regards nitrogen exhibit a considerable degree of immunity, even if the phosphates and potash are also present only in small quantities.

IV. Lithium salts are also effective in producing immunity, while nitrates of lead and zinc, particularly the latter, render plants extremely susceptible. Other salts of lead and zinc have very little effect on the susceptibility of plants.

V. A variety of wheat which is almost immune to a disease (such as Little Joss to yellow rust) tends to retain its immunity even when supplied with excess of nitrogenous food-material.

VI. Increased immunity does not appear to be due to a lack of food material available for the fungus in the host, as suggested by Marshall Ward, because the plants rendered relatively immune by adding phosphates or potash to their food-supply were as healthy and well-grown as those receiving no such additions.

It yet remains to be seen what physiological explanation can be found to account for the changes in susceptibility to certain diseases which can be produced in some cultivated plants by the use of certain fertilizers, and by certain chemical substances used as fertilizers.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

1101 - **A Preliminary Note on a Bacterial Disease of Fruit Blossom and Foliage.** — Barker, B. T. P. in *The Gardener's Chronicle*, Vol. LIII, No 1375, p. 287. London, May 1913.

Early in April 1913, many blossom trusses of pears showed signs of the discoloration and blackening which is commonly attributed to frost or cold winds. The weather at that time was not, however, severe enough to have caused the damage, further, the extent of the trouble varied considerably, both on similarly situated bushes of the same variety and on adjoining branches of the same bush, while the styles and stigmas of many flowers were completely discoloured when the flower was still an unopened bud and showed no external sign of damage.

On microscopical examination of the injured flowers, large numbers of small rod-like bacteria were found in the discoloured areas. That the disease could be produced by inoculation was proved by experiments.

It seems certain that a very large percentage of the damage hitherto regarded as due to low temperature effects must be attributed to the action of the above-mentioned bacillus, which must be widely distributed in England, judging from the large number of trusses of affected pear blossom sent to the writer. It appears that this is the first record of the occurrence of this organism as the cause of pear blossom disease. Its cultural characters and the nature of the disease produced by this parasite prove it to be quite distinct from *Bacillus amylovorus* De Toni, described by Whetzel and others as the cause of " fire blight " of pears. The leaves and all parts of the flower are attacked by the organism. Whether or not it attacks the shoots and branches of the tree is at present uncertain. In the case of the variety Catillac, many developing buds have been found seriously injured.

The disease may possess considerable importance in connection with investigations on self-sterility and other fertilisation problems of varieties of different fruits.

1102 – **Cryptogamic Diseases Observed at Barbados, West Indies, in 1911-1912.**

See below No. 1113

1103 – ***Ophiobolus herpotrichus* and Straw Blight of Wheat.**

— VOGES, ERNST in *Zeitschrift für Gärungs-Physiologie*, Vol. III, Part 1, pp. 43-83, figs. 1-5. Berlin, 1913.

The supposed agent of wheat straw-blight, *Ophiobolus herpotrichus* Fries, appears from the month of June upon the stalk, leaves and shoots at the base of the whitened stem of the dead wheat plant. It occurs in the form of a stroma covering the nutritive substratum like felt. In a damp chamber, the hyphae of this stroma, when lately formed, produce conidiophores of *Fusarium rubiginosum* App. and Wollw.

On artificial nutritive media, the ascospores of the fungus germinate in a quite irregular manner. Some of them, after producing bodies resembling spores, take the form of a durable mycelium. This fungus possesses two kinds of mycelium : one durable and thick-walled, brownish yellow and thorn-like, the other finely filamentous, delicate, and light-coloured. The first corresponds to the mycelial covering of the lower internode of the stalk, and is characteristic of wheat straw-blight ; the second kind of mycelium bears as reproductive bodies the conidia of *Fusarium.*

If the mycelium of *Ophiobolus* grown on a culture medium is transported on to young wheat plants which have been well boiled, a luxuriant growth of *Fusarium* results, and the brown mycelial covering appears on the stalks just as it does in the open in the case of wheat attacked by strawblight.

The *Fusarium* resulting from the culture of the ascospores of *Ophiobolus herpotrichus* is *F. rubiginosum* the so-called " Schneeschimmel ". The fructiferous form of *O. herpotrichus* is very probably *F. rubiginosum* and not, as has hitherto been supposed, *Hendersonia herpotricha* Sacc.

According to the writer, the yellowish-green mycelial covering, which appears on the lower internode of the stalks of wheat plants that have died prematurely and bear white empty ears, is not characteristic of straw-blight, since alongside of these plants with white stalks covered with mycelium, almost as many are found which have turned yellow prematurely and have died, though free from any coating of the mycelium in question. Thus *O. herpotrichus* cannot be regarded as the specific agent of straw-blight. The disease may arise from different causes; it occurs especially as a result of injury due to frost. *O. herpotrichus* is not a definite enough parasite to be able to penetrate directly into the healthy tissues of the wheat plants, and it is only when these are weakened by other causes, by meteorological agents and the attacks of nematodes in particular, that the fungus succeeds in affecting an entrance. The appearance of the mycelial covering is a secondary phenomenon and is chiefly formed by the durable mycelium which becomes entangled and intergrown with the filaments of *Cladosporium herbarum* Link. and *Mucor racemosus* Fresen. According to the writer, the conidial form *F. rubiginosum,* which successfully attacks plants that have been already weakened, is more to be feared than *O. herpotrichus.*

1104 - **A Dry Rot of Sweet Potatoes Caused by *Diaporthe Batatis.*** — HARTER, L. L. and FIELD, ETHEL C. — *U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin* No. 281, pp. 37 + figs. + 4 plates. Washington, May 1, 1913.

This disease was observed for the first time in 1890 in New Jersey and was attributed to an undescribed species of *Phoma* to which the name *Phoma batatae* was subsequently assigned. As the rot occurred only occasionally, it was not considered of much importance and during the 22 years which have elapsed since its discovery it has not been made the subject of further study. According to the writers, the damage occasioned by this disease is greater than is supposed, as its ravages are often attributed to other causes, such as stem-rot, black rot, or even drying up owing to lack of moisture. Of late years, this disease has been recorded from New Jersey, Virginia, Mississippi, Texas, Alabama, Indiana and North Carolina.

The writers describe the course of "dry rot" in the hotbed (a yellowing of the stem preceding the formation of pycnidia), in the field, where the pycnidia do not form until the plants are in a weak or dying condition, and in the store-house where the first symptoms appear from four to six months after digging. The stored tubers show the characteristic dried, shrivelled appearance starting at the stem end and gradually extending through the tissue. Later they become hard and mummified.

The bulletin contains an account of the different stages of the life-history of the fungus and gives the synonymy of the organism. The parasitism of the latter was proved by inoculation experiments, and its behaviour on different culture media was ascertained, as well as the influence of light on the growth and formation of its fruiting bodies.

The writers sum up the results of their investigations as follows:

The ascogenous form of the organism causing dry-rot of sweet potatoes is a *Diaporthe* and has been given the species name *batatis* by the writers. The pycnidial stage was first described by Ellis and Halsted as *Phoma batatae* but the inperfect stage has been considered in the present work as belonging to the form genus *Phomopsis.* The disease is chiefly a storage trouble. It is characterised by a drying and shrivelling of the potato, on the surface of which appear many small pustules — the pycnidia lying close together and eventually covering the whole surface. The disease occurs also in the hotbed and in the field. The organism is not a vigorous parasite, and consequently under ordinary conditions does not become evident until some time after harvesting. Diseased vines have been collected in abandoned hotbeds.

The pycnidial stage develops from the ascospores in 6 to 10 days. Ascospores are formed from the ascogenous strain in 4 to 6 weeks on cereals, but they are always preceded by the formation of pycnidia. Both stages were derived from the same isolation. Inoculations with pure cultures of the pycnidial stage both in the greenhouse and in the field gave successful infection. Successful infections were also obtained from re-isolations. Inoculation on the Potomac Flats with pure cultures of the ascogenous strain gave successful infections. Isolations of the organism were secured in planted plates from green stems of infected plants. Pycnidia, however, form only on the dead or moribund tissues. In the greenhouse, pycnidia occur on the leaves, stems, and roots of inoculated plants. The ascegenous stage fruits well on all cereals tried (corn meal, rice, wheat, barley, oats, rye, buckwheat) and sparingly on sweet-potato cylinders and sweet-potato stems. The disease is disseminated chiefly by the " seed " and by the use of decayed potatoes for manure. Diseased potatoes should be cooked before feeding to stock. They should never be scattered on the fields as a fertilizer. Seed beds should be sterilized and potatoes to be used for seed carefully selected.

1105 - **On the Rotting of Potato Tubers by a New Species of *Phytophthora* having a Method of Sexual Reproduction hitherto Undescribed.** — PETHYBRIDGE, GEORGE H. in *The Scientific Proceedings of the Royal Dublin Society*, Vol XIII (N. S.), No. 35, pp. 529-565 + plates XLII-XLIV. Dublin, March 1913.

The writer in his introduction gives a short summary of the literature dealing with the various forms of rotting which occur in the potato tuber. In some cases, it is probable that potato tubers sometimes die what may be called a natural death, or at least one in which the active participation of parasitic organisms does not occur ; but, as a rule, the rotting of potatoes is nowadays regarded as the direct result of the attack of some parasite. Animal pests frequently cause wounds in the skins of the tubers and thus facilitate the entrance of bacteria and fungi. A considerable number of bacteria have been described which are pathogenic to the potato tuber ; to these must now be added *Bacterium xanthochlorum*. There are relatively few fungi which have been proved to be the primary causes of potato rot, the best known being *Phytophthora infestans* De Bary.

Dry rot is generally regarded as caused by *Fusarium Solani* Sacc., but in view of the recent work of Appel and Wollenweber, it is possible that this disease may be due to more than one species. " External dry rot " has been shown to be caused by *F. trichothecioides* Wollenw.

Frank has credited *Hypochnus Solani* Prill. and Del. (= *Rhizoctonia solani* Kühn) with producing wet rot in potato tubers, the evidence he relied on was, however, inconclusive, and the writer failed in producing the disease by means of inoculation with this fungus. *Rhizoctonia violacea* Tul. is an actual parasite on the potato tuber.

The present paper deals with a new and highly characteristic type of tuber rot which occurs in Ireland (and will probably be found to occur elsewhere) caused by a new species of fungus closely allied to *Phytophthora infestans*, but differing in certain important essentials from the latter. It was first observed in 1909 in pots at the Temporary Station for the Investigation of Plant Diseases established by the Department of Agriculture and Technical Instruction for Ireland at Clifden, Co. Galway, and has since been received from other parts of the country. During the last two seasons, the disease has become of increasing virulence. It is prevalent in the West of Ireland and it seems that the loss in tubers occasioned may be considerably greater than that due to the attacks of *P. infestans*. The disease is particularly virulent on certain portions of land which have been continuously cropped with potatoes (infection taking place from the soil), and it would appear to be quite easy to prevent its occurrence by following a proper rotation of crops, and planting only potatoes derived from clean land. Infection is probably to be accounted for by the fact that some of the "resting spores" of the fungus adhere to the external surfaces of the "seed" tubers; it seems fairly certain that the disease cannot be transmitted by the presence of the fungus within the tubers, as the rot caused is so rapid that the tubers are destroyed in a few days.

A preliminary notice respecting this disease has been published in the *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. XII, No. 2, 1912, p. 375.

The method of the development of the sexual organs of the fungus is peculiar and novel. The writer suggests the name *P. erythoseptica* for this hitherto undescribed species of *Phytophthora* and that of "pink rot" for the disease which it occasions. A detailed description is given of the symptoms of the rot, which usually begins at the proximal end of the tuber and progresses rather quickly towards the distal end. In the field or store the rot would probably be regarded as of the "wet" type. The cut surfaces of affected tubers quickly turn pink when exposed to the air, and later become almost black.

The pathogenetic agent has been isolated by placing pieces of infected tissue in suitable media; when inoculated into healthy tubers, the latter became infected. No infection followed in carrots and parsnips, while in the cases of the mangel and swede the rot was neither very rapid nor pronounced. In the white turnip a decided rot was produced, but its progress was not so rapid as in the potato. Inoculation experiments with scarlet-runner beans showed that the fungus was incapable of causing infection through the uninjured skin of the pods.

The writer gives a detailed description of *P. erythroseptica* and its sexual organs. The oogonial incept enters the antheridium at or near its base, grows up through it and out of the top, expanding there to form the oogonium proper in which the oospore develops. It is not certain whether fertilization occurs, but if so it would appear to take place before the formation of the oosphere. The production of oospores and conidia has not yet been seen in or on the potato tuber itself, but it has been observed in cultures grown on various media. *P. eryphroseptica* can be cultivated on such media much more readily than its near ally *P. infestans*. It would appear that the production of oospores is inhibited by acid, and that the conidia are usually produced only under water.

P. infestans de Bary and *P. Phaseoli* Thaxt. agree with *P. erythroseptica* in the manner in which the oospores are produced, while it is highly probable that *P. omnivora* var. *Arecae* Coleman will be found to follow the same mode of development. The sexual organs of *P. Cactorum* Schroet., *Peronospora Fagi* Hartig (*P. omnivora* De Bary) and *Phytophthora Syringae* Klebahn are developed in the manner described by De Bary for his *P. omnivora*, which is usually regarded as typical for all species of *Phytophthora*. The writer suggest that only those species whose sexual organs are developed according to the *infestans*-type should be retained in the genus *Phytophthora*, and that those which follow the *Cactorum*-type should be placed in a new genus for which the name *Nozemia* is proposed. The genus *Phytophthora* thus amended is to constitute, at present, the sole member of the family *Phytophthoraceae*.

An addendum gives further information as regards *P. Faberi*, *P. Nicotianae* and *P. Jatrophae* when grown in pure cultures. The bibliography appended contains 26 works.

1106 – **On *Phytophthora parasitica* nov. spec., a New Disease of the Castor Oil Plant.** — DASTUR, JEHANGIR FARUNDJI in *Memoirs of the Department of Agriculture in India, Botanical Series*, Vol. V, No. 4, pp. 177-231 + X plates (one coloured). London, May 1913.

Hitherto Castor rust (? *Melampsorella Ricini* de Toni) is the only important fungus pest which has been recorded as attacking the castor oil crop at Pusa, and yet two other serious parasites occur there: one is *Phytophthora parasitica* nov. spec., the other is a species of *Cercospora*. The latter attacks the leaves only, but in wet weather about 90 per cent. of the foliage of the castor oil plant is covered with *Cercospora* spots, which is a serious menace to the eri-silk industry. Further in August and September *Choanephora* attacks leaves, growing points, and tender shoots, while there is also an *Alternaria* found occurring on the leaves which might be parasitic. All these diseases will be dealt with in another paper when their study is complete.

Phytophthora on castor was first found at Pusa in 1909 in August. Since then it has been found to appear every year after the rains have set in, in June, while the disease disappears by the beginning of September, at the end of the rains. About 19 varieties of castor were grown on the Pusa Farm in 1911, but none of them escaped the attack of this fungus. *Phytophthora parasitica* is the most injurious of the fungal parasites of castor; it destroys seedlings and attacks leaves of older plants. The silkworms refuse to eat the diseased portions of the leaves and their growth when fed on diseased foliage is very slow as compared with those fed on healthy leaves.

In the case of a monsoon (Kharif) crop, the most critical time is when the seedlings are about six to eight inches high and their stems are quite tender. In low-lying, water-logged, and badly drained fields, about thirty to forty per cent. of the seedlings damp off. The first indication of the disease is the appearance of a roundish patch of an unhealthy dull green colour on both surfaces of the cotyledon, which soon hangs down from its point of attachment. The disease spreads from the leaf to the petiole, thence to the stem and the growing point, killing the seedling. In older plants, the disease in the field is localised on the lamina. As the diseased spot gets older it turns yellowish and then brown. It spreads concentrically, and in old spots forms concentric brown rings enclosing lighter brown areas. Sometimes the diseased areas become confluent. The affected leaves have a tendency to fall off prematurely.

The mycelium is both intracellular and intercellular. The long unbranched sporangiophores emerge through the stomata, or between the walls of two contiguous cells. Internal sporangia have often been observed in the tissues of the leaves, stems and fruits; in a few cases they have been seen to germinate conidially in the soft tissues of the pericarp of the fruit. The writer has, so far, failed to find typical oospores in nature.

Inoculation experiments were made using a fragment of diseased leaf, a little mycelium, or zoospores from cultures of the fungus. In all cases the effect of the inoculation was clearly perceptible within 24 hours, and sporangia were produced in 48 hours after the operation, provided the inoculated leaf was kept moist. The germ tubes of the zoospores penetrated the leaf, either through a stoma, or by breaking through the upper wall of the epidermal cells, or by penetrating between the walls of two neighbouring cells. Infection experiments were also successful in the case of flowers and fruits, though these are not attacked under natural conditions. Seedlings planted in infected soil gave first positive results, and subsequently negative results at the end of two months; this shows that the fungus in the soil was not able to retain its vitality for two months.

The writer describes in detail the technique of pure cultures, the morphology of this fungus in culture as compared to that of its allies, the different nutritive media used and the inoculation experiments carried out on various host plants by means of suspending motile zoospores of *Ph. parasitica* (obtained from pure cultures) in distilled water. The results were positive in the cases of young plants of *Solanum tuberosum* and of seedlings of *S. Lycopersicum* and *S. Melongena*. The disease remained localised on inoculated mature leaves. Potato tubers could be inoculated only through wounds; tomato fruits could not be inoculated, even when wounded, and in no case was there any formation of sporangia. Lilac plants did not take the inoculation vigorously. Two species of *Oenothera* were readily infected by inoculation, as were young seedlings of *Salpiglossis variabilis*, *Gilia nivalis* and mixed species, *Clarkia elegans*, *Schizanthus retusa* and mixed species and *Fagopyrum exulentum*. About fifty per cent. of *Sesamum* *indicum* sown in a field where castor was grown the previous year were attacked by *Phytophthora,* and successful cross inoculations showed that the fungus was the same as the castor *Phytophthora.* Negative results were obtained by inoculating *Opuntia Dillenii,* two species of *Cereus,* cacao fruits and apples, *Colocasia antiquorum, Lepidium sativum, Panax,* tobacco, *Cleone* sp., four species of *Jasminum, Phaseolus lunatus* and *Phaseolus vulgaris.*

The infection experiments showed that some of the plants that were susceptible to infection by *Ph. omnivora, Ph. omnivora* var. *Arecae* and *Ph. Faberi* can be inoculated also by *Ph. parasitica.*

Nevertheless, the study of these fungi in pure cultures showed very little in common between them; the latter is distinguished from the others especially by the method of the development of its sexual organs. On no other *Phytophthora* except *P. Colocasiae* has the oogonium been invariably found to originate from within the antheridium, or to arise from a separate stalk which penetrates the antheridium and grows through it.

After establishing the differences between *Ph. parasitica* and its allied species, the writer gives a botanical description of the former.

1107 – **Diseases of Rubber, Cacao and Cotton Observed in Southern Nigeria in 1912.** — *Annual Report on the Agricultural Department for the Year* 1912, pp. 6-9.

The fungus flora so far observed of economic plants in Southern Nigeria is very similar to that of Southern India, Ceylon, Malaya, Java, and the East generally. The following diseases have been recorded by Mr. C. O. Farquharson, mycologist of the Agricultural Department of Southern Nigeria, in the course of his tours of inspection in the different districts.

Rubber Diseases. — Two fungi have been found in the colony causing decay of the roots of the Para trees (*Hevea brasiliensis*); these are *Fomes semitostus* Berk. (*Polyporus lignosus* Klotzsch) and *Hymenochaete noxia* Berk. The best method of controlling the first is to get rid of all infected material, to treat the soil with quicklime, and to check the advance of the mycelium by digging a circular trench at some distance from the affected tree. As the fungus also grows on the decaying bush stumps, it is necessary to have these removed. *Hymenochaete noxia* is easily recognised by the manner in which the mycelium binds together a mass of sand grains and small stones to the surface of the roots. The stem disease (*Corticium salmonicolor* B. et Br.) is not uncommon in the Sapele district; trees are most commonly attacked at the forks and in consequence the whole crown very often dies.

Cacao Diseases. — *Hymenochaete noxia* Berk. is not rare on roots of cacao trees. One case of *Fomes semitostus* Berk. was found in the Agege district, but so far its occurrence on cacao seems to be exceptional. The cause of cacao "canker" may still be regarded as a matter of dispute; it has been ascribed to two different fungi at least: *Phytophthora Faberi* Maubl. and *Spicaria colorans,* an imperfect stage of a *Nectria.* Another fungus which produces effects very similar to "canker" has been found on all parts of the plants except the roots and the fruits. This appears to be the most serious cacao disease in the Colony and a full description will be published as soon as possible. Brown rot due to *Thyridaria tarda* Bancroft, and a disease caused by *Nectria Bainii* Massee have both been noted on the pods. Pod anthracnose is not uncommon; it may be provisionally attributed to *Colletotrichum theobromicolum* Delacroix.

Cotton Diseases.—Many cotton seedlings were attacked by "sore shin", a disease which does not seem to be due to any specific organism. American cottons are chiefly affected by physiological diseases, such as "red rust" which is characterised by the leaves early in the season turning a reddish purple colour, especially in the spaces between the veins. The leaves soon fall off, their fall being hastened by the presence of fungi. This occurs during periods of excessive rainfall, when the soil is not properly aerated, or through failure of rain fall, and the condition was most marked in Agege cotton. In a disease known as "shedding of forms", the plant produces more "forms" than could mature as bolls; the shedding of these superfluous forms, if excessive, is, however, due to unsuitability of soil. Leaf spot of cotton is of obscure origin; it is probably caused by variations in temperature and humidity. The affected leaves are covered with greyish brown spots with a dark purple border. In all the cotton districts areolate mildew is very common; it is produced by a fungus, *Ramularia areola* Atk., but causes little damage. Other cryptogamic diseases are cotton anthracnose, due to *Colletotrichum Gossypii* South, boll rot caused by a species of *Diplodia* and cotton rust which is widespread and produced by *Uredo Gossypii* South.

The native cottons are of two distinct varieties, the Meko, a green-seeded form, and the naked-seeded Ishan variety. Both are subject to "leafcurl", a disease which distorts the leaves, the younger branches and the upper parts of the plant, and restricts flowering. The disease is still under investigation. Another disease almost peculiar to the native cotton and of which the origin is not clear is characterised by a blackening of the midrib and main veins of the leaves and is associated with the presence of numerous bacteria and a *Fusarium*. It was not found on any of the North American cottons, but occurred on Brazilian cotton which bears several botanical characters suggesting a relationship with the native varieties.

1108 – **Some Diseases of the Sweet Pea.** — TAUBENHAUS, J. J. and MANNS, THOS. F. (Dept. of Plant Pathology, Delaware College Experiment Station, Newark, Delaware, U. S. A.) in *The Gardener's Chronicle*, Vol. LIV, No. 1385, pp. 21-25. London, July 12, 1913.

The sweet pea (*Lathyrus odoratus*) is subject to various bacterial and fungous diseases, some of which are described and figured in this article.

The Mosaic Disease. — This disease is easily recognised by the yellow dotting or mottling of the leaves. In varieties with thick leaves, this mottling is associated with curling; when the leaves are thin and delicate, they turn yellow and drop prematurely; in very advanced stages, the disease is also noticed on the stems.

Infected seedlings often outgrow the disease entirely and make a healthy new growth at a later period. Badly diseased plants often bear flowers, but these occur either on very short peduncles or they have curled and distorted petals and the colour of the blossom is faded. All varieties, with the exception perhaps of the dwarf varieties, are subject to the disease. Other leguminous plants which suffer from a similar mosaic affection are *Trifolium pratense* and several forage species of *Lathyrus*. The mosaic disease of the sweet pea may be induced artificially by inoculation. Under field conditions the green aphids appear to be active agents in the distribution of the malady, while the latter may be reproduced in the laboratory by transferring green aphids from infected plants to healthy ones.

Root Rot caused by *Thielavia.*—Chittenden and Massee have suspected the fungus *Thielavia basicola* to be the cause of the streak disease of the stem. This the writer has shown to be of bacterial origin and related to a bacterial disease of the clovers. Plants affected by *T. basicola* have little, or pratically no, root system; they remain very dwarfed and are useless for flower production. Healthy seedlings are readily infected by placing this fungus on the root of plants growing in sterile soil.

Root Rot caused by *Rhizoctonia* (*Corticium vagum*).—This fungous disease is common to many seedlings, *viz.* lettuce, tomato, tobacco, pea and others. Severely infected plants have scarcely any root system; in less infected seedlings, only one or two rootlets may be destroyed.

Stem or Collar Rot.—This is due to *Sclerotinia libertiana*; it is usually a seedling disease, though it may attack plants of all ages. The same fungus causes a drop disease of lettuce and of other plants. Stem-rot occurs chiefly in poorly ventilated houses, in over-watered, badly drained beds, and in damp places out of doors. The disease spreads very rapidly and is soon fatal. The fungus penetrates the collar of the stem and completely invades the vessel of the plants, thus clogging the upward flow of the water from the roots to the stem. Affected plants first show a wilting of the tip and flagging of the leaves, and finally the seedlings collapse. *S. libertiana* is a soil organism which occasionally causes root trouble on clover. It is sometimes introduced with animal manure.

Fusarium Wilts or Root Rots.—These are caused by two distinct fungi which produce the same symptoms, namely a wilt and root rot. Seedlings are affected when they reach the height of about 8 to 10 inches, when they wilt and collapse. The bark or cambium is destroyed by the fungus. The rotting seedling becomes a breeding place for flies, which carry the spores to healthy plants; rain and running water also distribute the disease. These species of *Fusarium* are as yet undetermined, but more work on them is in progress.

Root Galls (*Eel worms*).—These swellings are produced by *Heterodera radicicola*. The disease is a common greenhouse trouble, where it attacks roses, violets, carnations, begonias, lettuces, cucumbers and tomatos. It is not often met with in the field, and is introduced into the greenhouse with infected soil or manure.

Bud Drop or Failure to set Blossoms. — The buds appear on apparently healthy plants, but quickly wither and finally fall. The disease results from the use of a too highly nitrogenous food ration, poor in mineral elements, especially phosphorus and potassium. The writer successfully controlled this trouble within a week by the application of phosphoric acid and sulphate of potash.

Anthracnose. — A disease due to *Glomerella rufo-maculans* (B.) Sp. et Usch., which is sometimes manifested in a wilting and dying of the tips; at other times the disease spreads downwards and involves the entire branch. On leaves the disease starts as whitish spots which enlarge and involve the whole area. At the time of blossoming the fungus attacks the peduncle and sometimes the flower bud as well, and causes them to dry up. Infected pods shrivel and are covered with salmon-colour patches. *G. rufo-maculans* also causes the bitter rot of the apple and the ripe rot of grapes. Cross-inoculations by Sheldon and Taubenhaus have definitely proved that the fungus can go back from the apple to the sweet pea and vice versa, in each case producing the typical symptoms of the disease. Anthracnose is of great economic importance. When once introduced into a field the disease spreads rapidly, often destroying the whole crop. It may attack young seedlings in the greenhouse. In field conditions the disease starts about July 1; it is carried over winter on cankered limbs and mummied fruit of diseased apples, or on the diseased pods and seeds of the sweet pea, and also in the soil.

Powdery Mildew. — This disease is very prevalent on greenhouse sweet peas and on irrigated fields and low land, or where plants are grown too thickly. Usually, however, in small garden lots, especially if these are not watered, the disease is practically unimportant, as it is usually very mild during the active growing season and becomes more abundant only when the plants have served their purpose. Massee attributes the sweet pea mildew in England to *Erysiphe polygoni*. So far, only the conidial or oidium stage has been found in the United States, so that the identity of the fungus there is as yet not definitely established.

1109 - **Diseases of Raspberry and Loganberry.** — *Board of Agriculture and Fisheries, Leaflet No.* 269, pp. 3 + fig. London, April 1913.

During recent years the canes of raspberies and loganberries in Great Britain have been observed to suffer to a considerable extent from the effects produced by microscopic parasitic fungi, which are stated to be yearly extending their range of activity. These fungi have been known for more than half a century as parasites on wild roses, brambles, and other rosaceous plants, and their rapid recent extension does not imply any increased power of parasitism, but is simply due to the larger number of suitable host plants grown in juxtaposition.

Hendersonia Rubi Westendorp is responsible for most of the injury caused to raspberries and loganberries. The canes are first attacked, infection taking place during the summer.

The first indication of the presence of the parasite is, as a rule, the appearance of lurid red or purplish patches on the young stem; during the winter these patches become grey or white owing to the bark having been killed. These dead parts of the bark are then thickly scattered over with the minute black fruits of the fungus, which contain myriads of coloured four - celled spores. When mature these spores escape into the air and thos that alight on young shoots germinate and enter the tissues, thus ensurin the continuance of the disease in the next season. When several disease, patches are present the canes are killed outright during the winter, wherea when only one or two affected areas are present, the cane may survive an produce a certain amount of fruit. It is well however, to remove and burn a canes even if slightly attacked, as it is only by such means that the diseas can be eradicated. Infection mostly takes place at the period of the yea when fruit is present , hence spraying cannot be practised unless the frui is sacrificed, when Bordeaux mixture should be used. Even in these cir cumstances every diseased cane should be cut down the moment it is observed.

Ascochyta pallor Berk. sometimes occurs as a parasite on the stems of raspberries, roses and brambles. It forms whitish dead patches studded with black dot-like fruits, Treatment should be similar to that suggested in the case of *Hendersonia Rubi.*

1110 - A Disease of Greengage Trees Caused by *Dermatella Prunastri* Pers.

— DOWSON, W. J. in *The New Phytolo,ist.*, Vol. XII, No 6, pp. 207-216, 3 figs. London, June 1913.

This disease has been observed for some years in the greengage plantations at Willingham and Cottenham near Cambridge. The writer carried out his investigations upon it in the Botany School, Cambridge. The disease attacks branches of all sizes and belonging to old or young trees. The dead branches were easily distinguished from healthy ones by the fact that they were covered with *Pleurococcus* sp. and lichens. The pycnidia and apothecia of *Dermatella prunastri* occurred chiefly on the distal end of the branches, though sometimes they were observed at the base. Much gum was produced in the diseased wood. The tissues invaded by the mycelium became discoloured and died. The hyphae were most abundant a short distance behind the junction of discoloured and healthy tissue.

The writer gives the synonyms of the fungus, a detailed description of the latter, together with a description of the disease and the results of field, culture, and inoculation experiments. The results so far may be thus summarized:

1) *Dermatella prunastri* Pers. has been grown in pure culture from conidia and from ascospores. 2) The mycelia arising from both these kinds of spores, when growing on nutrient agar and sterilised pieces of greengage wood and bark, produced pycnidia after some three weeks' growth. (3) The mycelium was found present in all the tissues of the host and particularly in the wood and pith. 4) The vessels, tracheids and fibres are not delignified, and the hyphae pass from one cell to another by way of the pits. 5) The my-

celium advancing up a branch is preceded by gumming in the woody elements. 6) The inoculations of healthy greengage trees with the mycelium of *Dermatella prunastri* led to infection.

1111 – ***Peridermium Laricis* a Parasite of *Larix europaea* in Scotland.** – BORTHWICK, A. W. and WILSON, MALCOLM in *Transactions of the Royal Scottish Arboricultural Society*, Vol XXVII, Part II, pp. 198-202 + fig. Edinburgh, July 1913.

The writers found upon some leaves of larch (*Larix europea*) sent from Fersit in Inverness-shire a fungus which, although not agreeing in all respects with *Aecidium* (*Peridermium*) *Laricis* described by Klebhan (*Zeitschr. f. Pflanzenkr.*, Bd. IX, 1899, p. 14), differed too slightly from the latter to justify the creation of a new species.

The parasite appeared early in the season and was fully developed on leaves when they were about three weeks old; the branches shed their diseased leaves at the end of July. The fungus was almost always found on the under surface of the leaves but occasionally it occurred on the upper side.

Coeoma Laricis bears a considerable resemblance to the form just described as occurring on the larch; it is however at once distinguished from *Peridermium Laricis* by the entire absence of the pseudoperidium, as well as by differences in the sculpturing of the spore wall. *Coeoma Laricis* has been shown to be the aecidial stage of six different species of *Melampsora* in which the uredospore and teleutospore stages occur on various species of *Populus* and *Salix*. Klebahn, by infection experiments commenced in 1896 in the neighbourhood of Hamburg, proved that *Peridermium Laricis* is the aecidial condition of the cryptogam then called *Melampsora betulina*, but for which he proposed the name *Melampsoridium betulinum*, establishing the difference between the two genera as follows:

Melampsoridium: aecidium of the *Peridermium* type, uredospore sorus with a definite pseudoperidium.

Melampsora: aecidium of the *Coeoma* type, uredospore sorus surrounded by capitate hairs, but without a definite pseudoperidium.

Saccardo (*Sylloge Fungorum* XXI) records the presence of *Peridermium Laricis* in France and Germany; Arthur and Kern include it in their list of North American species, for *Melampsoridium betulinum* is common in N. America, but the stage on the larch has not yet been found in that country. Considering the abundance of *Melampsoridium betulinum* in Scotland it is a remarkable fact that *Peridermium Laricis* is of such rare occurrence. Its resemblance to *Cocoma Laricis* may however partly explain the absence of previous records. It is possible that *Melampsoridium betulinum* really consists of several physiological species and that *Peridermium Laricis* is only one of its aecidial forms; this supposition may explain the absence of records from North America.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC
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PLANTS

1112 - **Broom as one of the Chief Centres of Distribution of Dodder in Mountainous Districts.** — MODONESI, M. in *Il Coltivatore*, Year XIX, No. 18, pp. 569-571, 1 fig. Casalmonferrato, June 3, 1913.

The writer, basing his observations on his personal experience, draws attention to the fact that the solitary broom bushes which grow on the steepest slopes, often act as hosts of dodder, thus disseminating the pest over the adjacent plain. He advises careful watching and the burning of all infected bushes.

INSECT PESTS.

ENERALITIES

1113 - **Insect Pests and Cryptogamic Diseases observed in the Barbados and West Indies, during 1911-12.** - *Imperial Department of Agriculture for the West Indies, Report on the Botanic Station, Montserrat*, 1911-12, pp. 16-17. Barbados, 1913.

Insect Pests. Maize is liable to few fungoid pests, but is invariably attacked by the "corn ear worm" (the larva of *Laphygma frugiperda*). The eggs are laid on the grown up plants; the larvae attack first the leaves and later the stem of the plant. The first indications of the presence of the parasite are shown in the changes taking place in the young unfolded leaves.

Experients have been tried with Paris green in powder and solution, alone and mixed with lime, but owing to the scorching of the leaves it is of no use. Arsenate of lead has proved the most effective insecticide for this pest. It cannot be applied alone as it scorches the foliage, but mixed with four times its weight of lime or used as a solution in water (1 in 160). The latter method, however, is not so effective.

Paris green has also been effective in dealing with the attacks of the "Bengal bean caterpillar" (*Thermesia gemmatalis*) on *Mucuna utilis*. When applied as a mixture with six times its weight of lime it is liable to produce scorching of the leaves, but not defoliation. Arsenate of lead in similar proportions has no injurious effects.

On the Cotton plant, *Dysdercus andreae* and *D. delauneyi* have occurred and caused considerable destruction in the plantation during 1911.

The "cotton flower bud maggot", which attacks cotton in Antigua, has been definitely identified as being *Contarinia gossypii.*

Towards the end of 1911, the "Chaff scale" (*Parlatoria pergandii*) was discovered attacking Citrus plants at Grove station, and as it has not been observed outside the station it would appear to be a recent introduction.

The chief insect attacking the coconut in this island appears to be the Bourbon scale (*Aspidiotus destructor*), which is common on the leaves but cannot be regarded, as a serious pest.

Fungus diseases. Ground Nut Rust (*Uredo arachidi*). Further experiments were tried with 5 varieties divided into two series, one half sprayed with Bordeaux mixture on two occasions. The first application was given 27 days after planting before the pustules had appeared, and the second 32 days later (Sept. 19) when the fructifications had begun to appear. All the varieties were attacked, but less disease developed on the sprayed plots. The effect of the spraying on the yield of nuts is given below.

Variety	Yield in lbs.	
	Sprayed	Unsprayed
Carolina Running	145	126
Carolina Running (Small seeded)	81	93 ½
Gambia	108	122
Gambia (3 seeded)	114	115
Spanish	84	58 ½

As the results are not consistent, it has not been demonstrated that the fungus was in past years responsible for a shortened crop, or that it affected the quality of the nuts in any way.

Cotton Boll Soft Rot. — The mycologist suggests that a species of *Pythium* or *Phytophthora* is the probable cause.

It is particularly prevalent in damp seasons and damp localities, and causes considerable losses.

1114 - **The Argentine Ant *(Iridomyrmex humilis Mayr.)*.**— NEWELL, WILMON and BARBER, T. C. — *U. S. Department of Agriculture, Bureau of Entomology, Bulletin* No. 122, pp. 98 + XIII plates + 13 figs. Washington, June 26, 1913.

The Argentine Ant is the most injurious of the Formicidae in the United States and the writers believe that its depredations will extend as far as S. Califormia and the Gulf States. This paper gives the results of 5 years experiment at Baton Rouge, La., and at New Orleans.

I. humilis was first noticed at New Orleans in 1891 and has spread with great rapidity until it is now the foremost household pest and extends its ravages to the majority of crops grown in the South.

It is indigenous to the Argentine and Brazil and was accidentally introduced into Madeira, where it exterminated another ant (*Pheidole megacephala*), which was itself an introduced species, and had exterminated the native ant before it. Its occurrence has been recorded in Portugal, Capetown and Chile. It has thus established itself as a nuisance in four continents, and owing to its dissemination through the ordinary channels of commerce, it is reasonable to expect that it will eventually invade all the semitropical countries of the globe. There is every reason to believe that it was introduced into New Orleans by the coffee ships from Brazil and that it has spead by means of the railroads and driftwood. It is not definitely known at what altitude this insect is unable to thrive, but it is safe to assume that it could not extend its ravages beyond the minimum isotherm of zero.

Under natural conditions the rate of dispersal of these ants is very slow, some few hundred yards a year, but when food is plentiful (such as secretions of aphides or scale insects) nothing short of running water will stop them.

Of the means of dispersal there is no doubt that floating drift wood and the transportation of freight are the most important, and that the nuptial flight of the queens takes no part at all, owing to their inability to rear the grubs.

Up to the present it has attracted most attention as a household pest. During the rainy season, or when their natural diet is scarce, they invade the houses in myriads and almost drive the occupants to distraction.

The damage to plant life is due chiefy to the protective care which they bestow on scale insects and plant lice, and to their attacks on blossoms in pursuit of nectar. Owing to its fondness for the sugar cane mealy bug (*Pseudococcus calceolariae*) it is almost impossible to check the ravages of this bug where the ant is present.

In cotton plantations and corn fields the occurrence of this ant is responsible for large increase in the swarms of aphides and lice.

It is a veritable plague among honey bees and poultry, so that bee-keeping and chicken rearing become impossible.

The only substance that has been found to protect sitting hens is zenoleum powder, liberally sprinkled in the nest and among the hen's feathers from time to time during the brooding period.

Another form of injury is due to the destruction of beneficial native species of ants, such as the "fire ant" (*Solenopsis geminata*) which destroys larvae of boll weevils. Lastly, it may also be an important agent in the spread of disease in unsanitary districts.

The only activities of this ant that can be considered at all beneficial are concerned with the destruction of bed bugs, "chiggers" or so-called "red bugs" and the sorghum midge.

The writers give detailed descriptions of the species, methods of study, life history, colonies, habits, accounts of the symbiosis with other insects, the methods of their attack and repression.

Eggs are laid at all seasons of the year, but chiefly in summer. One queen was observed to deposit eggs at the rate of 30 per day, but suspended oviposition for several days at a time. The period of incubation varies from 12 to 55 days according to the temperature, the duration of the larval stage from 11 to 61 days. The pupal stage varies according to the sex, males requiring from 19 ½ to 28 days, workers from 12 ½ to 25 days and the queens 3 or 4 weeks. Thus it requires from 33 to 141 days, or an average of 74 days, for the complete development of an individual.

Of the three adult forms, the worker is the smallest (from 2.25 to 2.75 mm.) and lives from 10 to 12 months. The male varies in size from 2.8 to 3 mm., is winged and lives in the spring or (in limited number) in the autumn. The queen measures from 4.5 to 6 mm. and lives for several years. She is winged before fertilisation, but loses the wings afterwards.

The ants facilitate the multiplication of scale insects and aphides by constructing shelters of earth to protect them against adverse atmospheric conditions and parasites.

An invasion of these ants into a plantation is always accompanied by a renewal of the attacks of scale insects in sugar cane plantations and orangeries. The species of aphides and scale insects most favoured by these ants are given in the following list.

On bamboos: *Asterolecanium bambusae* Bdv., *Odonaspis secreta* Ckll., *Odonaspis inusitata* Green.
On banana: *Coccus hesperidum* L., *Chrysomphalus aonidum* L.
On cotton: *Aphis gossypii* Glov.
On corn: Undetermined aphis (probably *Aphis maydis* Fitch).
On figs: *Pseudococcus citri* Risso, *Lecaniodiaspis* sp., *Aspidiotus camelliae* Sign.
On hickory, elm, hackberry and various shade trees: *Pseudococcus* sp., *Ceroplastes cirripediformis* Comst., *Ceroplastes floridensis* Comst., *Chionaspis longiloba* Cooley, *Chionaspis americana* Johnson.
On magnolias: *Neolecanium cornuparvum* Thro., *Aspidiotus camelliae* Sign., *Toumeyella turgida* Ckll.
On mulberries: *Chrysomphalus tenebricosus* Comst.
On oaks: *Kermes galliformis* Riley, *Eulecanium caryae* Fitch., *Eulecanium quercifex* Fitch, various aphidids.
On orange: *Coccus hesperidum* L., *Parlatoria pergandii* Comst., *Lepidosaphes beckii* Newm., *Lepidosaphes gloverii* Pack., *Chrysomphalus aonidum* L., *Aphis gossypii* Glov., also the white fly, *Aleyrodes citri* R. and H.
On palms and other ornamentals: *Coccus hesperidum* L., *Eucalymnatus tassellatus* Sign., *Aspidiotus lataniae* Sign., *Aspidiotus hederae* Vall., *Chrysomphalus dictyospermi* Merg.
On peach, pear, and other fruits: *Aspidiotus perniciosus* Comst., *Aulacaspis pentagona* Targ., various aphidids.
On persimmons: *Ceroplastes cirripediformis* Comst., *Eulecanium corni* Bouché, *Pulvinaria vitis* L.
On strawberry: *Aphis forbesi* Weed.
On sugar cane: *Pseudococcus calceolariae* Mask., *Aphis gossypii* Glov.
On sweet gum: *Cryptophyllaspis liquidambaris* Kotinslky.
On various shrubs: *Coccus hesperidum* L., *Saissetia oleae* Bern., *Pulvinaria cupaniae* Ckll., *Aspidiotus lataniae* Sign., *Chrysomphalus aonidum* L.
On willows: *Eulecanium nigrofasciatum* Perg., *Pseudococcus* sp., (near *citri*), *Chionsaspis salicis-nigrae* Walsh, *Aspidiotus perniciosus* Comst., various undetermined aphidids.

An interesting factor concerned with the remarkable increase of scales and aphis which invariably accompanies infestation by this ant is the persistence with which the ants drive away the ladybirds which attempt to prey upon the insects fostered by them and it is extremely rare that a ladybird can be found at all on the infested trees.

The Argentine ant is destructive of nearly all other forms of insect life, any insect which it is able to hold in its jaws being suitable prey.

The natural enemies of this ant are remarkably few. Their destruction has been recorded by cockroaches (*Thyrsocera cineta*), spiders (*Theridium tepidarium*), birds (English sparrow and yellow hammer) and parasitic mites (*Pediculoides ventricosus*), but none of these are sufficiently effective to be of any economic importance. Experiments in the cryptogamic parasites (*Sporotrichum globuliferum, Bacillus larvae*) have also given negative results.

Methods of repression. — The only effective methods are those based on the actual destruction of the ants themselves, and these efforts must be directed against the queen ants as the progenitors of the race. As never more than 10 per cent. of the workers are required for foraging, their destruction does not seriously affect the rate of increase of the colony. Repellents are only of use in protecting food stuffs. As the result of numerous experiments, the use of running water and zenoleum powder have been found most effective. Coal-tar, pine-tar, tobacco dust and sulphur were found to be ineffective. Crude petroleum of all liquids was found to be most repellent. "Ant tape" soaked in corrosive sublimate is very effective in isolating tables and furniture generally. Cyanide used either as solution or fumigant was useless, but injections of carbon bisulphide gave good results. The writers also experimented with poisoned foods in the hope of finding a substance that would be included in the diet of the colony. A paste of 1 part arsenate of lead and 2 parts honey, and a solution of 0.25 gm. white arsenic and 20 grams sugar in 100 c. c. of water proved effective in destroying portions of the colony and in driving the remainder away from the vicinity.

Various devices have been constructed for preventing the invasion of bee hives by this pest, but on a commercial scale the cost is so prohibitive that the wisest course is to remove the apiary to an uninfected locality.

In orangeries "ant ditches" are constructed and supplied by pumps. Divided bridges with a 2 inch cleft through the middle are used to prevent the passage of the ants.

Flooding the ground and driving the ants to certain restricted areas has been successfully resorted to.

Winter trap boxes containing decaying vegetable matter are useful in collecting the colonies in winter, but clean surface weeding is essential to trapping all the colonies. Carbon bisulphide is used to destroy the colonies in the boxes.

A bibliography of 4 works is appended.

1115 - **Rice Water Weevil *(Lissorhoptus simplex)*.** — TUCKER, E. S. (Associate Entomologist, Louisiana Agricultural Experiment Station, Baton Rouge) in *The Rice Journal and Southern Farmer*, Vol. XVI, No. 7, p. 2. Crowley, Louisiana, July 1913.

This insect is the most serious pest of the rice crops in the Southern States. The adult appears only at right and is attracted in swarms by a bright light.

The writer has found dead specimens in Honduras rice and concludes that the weevils are not a menace to stored grain, but that they seek refuge on the sheaves of harvested rice in the filed and find their way through the thresher with the grains. He has found as many as 3 dead weevils in a sample of rice weighing 15 ounces, and the stock was of the previous season's harvest.

1116 - **Observations on *Pseudococcus bakeri* Esssig ("The Walnut Mealy Bug").** — VAILE, R. S. in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II, No. 6, p. 554. Sacramento, California, June 1913.

In December 1910 Essig described a new species of mealy bug and identified it as *Pseudococcus bakeri*. Since then he has observed the following host plants: walnut, apple, pear, orange, lemon, pomelo, elder, cottonwood, black walnut, nightshade and a few ornamental shrubs. On the elder and nightshade it appears to live primarily on the roots, and numerous solanum bushes have been found with the roots thickly covered with all the stages from eggs to mature adults. This is also true of elder, but it has not been observed on the roots of citrus or other fruit trees.

The life history appears to be much the same as that of *P. citri*, except that the egg masses are much looser and the number of eggs laid per female is less.

The average number of eggs per mass of *P. citri* is 274, whilst that of *P. bakeri* is about 67. Considering the lower fertility of the eggs of *P. bakeri* (10 to 20 % infertile) it does not seem probable that it will ever be classed as a damaging insect, and it seems to require no additional control measure. The writer suspects the presence of egg parasites, though up to the present it has not been demonstrated.

Carbolic acid emulsion and other sprays are effective against both species of *Pseudococcus*; fumigation is more efficient against *P. bakeri* than against *P. citri*.

MEANS OF PREVENTION AND CONTROL

1117 - **Sweet-Corn as a Culture-Trap for *Heliothis obsoleta* Hübn. ("Cornworm").** — COOK, A. J. in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II, No. 6, p. 555. Sacramento, California, June 1913.

Known variously as the "corn worm", "corn ear worm", "tomato worm" and "cotton boll worm", it has a decided preference for sweet-corn. This fact may be of great use to the tomato grower, for by planting a row of corn in place of every tenth row of tomatoes the moth is attracted from the less inviting tomato plants. Dusting or spraying with lead arsenate will save the corn; on a small scale it may be saved by hand picking.

1118 - **Arsenate of Lead as an Insecticide against the Tobacco Hornworms.** — MORGAN, A. C. and PARMAN, D. C. — *U. S. Dept. of Agriculture, Bureau of Entomology, Circular* No. 173, pp. 10. Washington, 1913.

The results of 5 years' experiments conducted by the Bureau of Entomology in Tennessee, Kentucky and adjoinging States. The former method of handworming having become too expensive has been replaced by the use of arsenate of lead as an insecticide. Paris green has been tried, but owing to damage by scorching of leaves and weakening of the leaf-stalk its use had to be abandoned. Arsenate of lead can be applied at any stage of growth, does not damage injured leaves and causes no irritation to the operator.

In applying arsenate of lead to tobacco plants it is necessary to mix it with some carrier to ensure even and thorough distribution. The best carrier for this purpose has been found to be finely silted freshly burnt wood ashes, an equal bulk of the ashes being used.

The arsenate should be of the di-plumbic form, as it contains a greater percentage of arsenic acid. The applications should be made when the dew is on the plants. For young plants an application of 3 ½ lbs of arsenate of lead per acre is sufficient, whilst full-grown plants require not less than 5 lbs. per acre. If spraying is adopted, a solution of 3 to 4 lbs. of arsenate in 100 gallons of water is required.

INSECTS INJURIOUS TO VARIOUS CROPS

1119 - **Insects injurious to Cotton in Burma.** - SHROFF, K. D. — *Department of Agriculture, Burma, Bulletin* No. 8, 1912, pp. 40 + 15 plates. Rangoon, 1913.

All efforts to introduce superior types of foreign cotton have hitherto proved abortive, and no variety is reported to have become established. At Mandalay almost all the plots of exotic cottons were found to be hotbeds of destructive insects. Local varieties suffer periodically from attacks of aphis (*Pya*), chafers (*Podigaung*), and crickets (*Payit*), especially when young, but as a rule the plants are healthy and free from disease.

The following list contains the varieties observed at the experimental station at Mandalay and during a tour of inspection in the cotton districts of Sagaing, Lower Chindwin and Myingyan (1908). The writer gives for each variety the indigenous name, a detailed description to accompany the figures, and the methods of combatting the pests.

Earias fabia Stoll., *E. insulana* Boisd.	(« The Spotted Boll Worm ») (1).
Gelechia gossypiella Saund.	(« The Pink Boll Worm ») (1).
Sylepta derogata Fabr.	(« The Cotton Leaf Roller ») (1).
Diacrisia obliqua Wlk.	(« The Hairy Caterpillar ») (2) (3).
Dysdercus cingulatus Fabr.	(« The Red Bug ») (1).
Oxycarænus lætus Kirby.	(« The Dusky Bug » (1).
Aphis gossypii Glov.?	(« The Aphis ») (1).
Fam. *Jassidae.*	(« The Leaf Hopper ») (1).
Cerococcus hibisci Green.	(« The Brown Coccid ») (1).
Two species not identified.	(« The Mealy Bugs ») (2).
Acridium æruginosum Burm.	(« The Black Spotted Grasshopper ») (2).
Brachytripes achatinus Stoll and *Liogryllus bimaculatus* De G.	(« Field Crickets ») (2).
Species not identified.	(« Chafer Grub ») (3).
Zeuzera sp. and *Alcides* sp.	(« Borers ») (3).

(1) Attacks indigenous as well as exotic cotton, but causes more damage to the latter.
(2) Attacks several plants, amongst them, cotton.
(3) Do not cause serious damage.

1120 - **The Spotted Beet Webworm *(Hymenia perspectalis* Hübn*).*** — CHITTENDEN, F. H. — *U. S. Department of Agriculture, Bureau of Entomology, Bulletin* No 127, Part I, pp. 11 + figs. Washington, May 31, 1913.

The author recorded the spotted beet worm in the District of Columbia in 1905 and again in 1912 without the insect having made an appearance in the interval. In 1912 it caused great damage to the sugar beets and various ornamental plants in gardens and glass houses. It is probably of African origin, and though not known in Europe it will probably in time become cosmopolitan. As a pest it has been observed only at Brooklyn, N. Y, and Washington, D. C.

The larvae are nocturnal in habits and conceal themselves about the bases of the plants near the roots and under portions of leaves or petioles resting on the ground. When full grown they are green in colour and about 10 mm. in length. Before pupating they turn pale and yellowish. The cocoon is formed on the plant or on the ground, and is covered with more or less webbing with occasionally a black excrement.

The larvae have been found on ornamental plants such as *Telanthera versicolor* and *Andresine lindeni.*

If has been found associated with other insects, namely the yellow-necked flea beetle (*Disonycha mellicollis* Say), the spinach flea bettle (*Disonycha xanthomeloena* Dalen) and the Hawaiian beet webworm (*Hymenia fascialis* Crown). Amongst the natural enemies of this pest are the larvae of the "spined soldier bug" (*Podisus maculiventris* Say) and a small braconid (*Hemiteles* sp.).

The closely related species, *Hymenia fascialis,* has several parasites, and it is very probable that further study and observation will find other natural enemies. As a check on the spread of this pest, spraying with Paris green at the rate of 2lbs. in 100 gals. of water or a mixture of nicotine sulphate 1oz., whale oil soap 4oz. in 4 gallons of water is recommended. Early ploughing in the autumn and a rotation of crops resistant to its attack should be practised.

1121 – **"The Striped Beet Caterpillar"** ***(Mamestra trifolii).*** — MARSH, H. O. *U. S. Department of Agriculture, Bureau of Entomology, Bulletin* No. 127, Part II, pp. 18 + figs. Washington, 1913.

The writer has observed this insect in the Arkansas valley during portions of four years, occurring on sugar beets and lambsquarter (*Chenopodium album*).

The larvae attack the leaves, causing defoliation, from which the plants recover provided the crowns have not been attacked. Three generations have been noticed in the Arkansas valley. The moths make their first appearance in May and deposit eggs, producing a generation in the first half of July. The July generation produces eggs which become moths at the end of August and the third generation larvae mature late, producing pupae which live through the winter in the soil. A single female produces about 500 eggs.

Preventive measures. — Cultivation of the land after harvest breaks open the cells and exposes the pupae to injury from weather and other causes.

There are several predaceous insects which feed on *Mamestra* larvae, *viz. Microdus inedius* Cress., *Meteorus* sp., *Phorocera claripennis* Macq., *Perilloides bioculata* Fab., and *Phidippus coloradensis* Thorell.

Spraying experiments have been conducted and Paris green proved most effective. The following formula is recommended:

Paris green	3 lbs.
Whale oil soap	6 lbs.
Water	100 gallons.

This should be applied with a field sprayer at the rate of 75 to 100 gallons per acre.

1122 – **The Red Spider on Hops in the Sacramento Valley, California.** — PARKER, WILLIAM B., — *U. S. Dept. of Agriculture, Bureau of Entomology, Bulletin* No. 117, pp. 41 + figs. Washington, May 1913.

This is an account of 18 months' observation and experiment on the red spider (*Tetranychus bimaculatus* Harvey) in the hop districts of the Sacramento valley.

Life history — The eggs are deposited singly and loosely amongst the webs and upon the underside of the leaves. From 10 to 450 may be found on a single leaf. The period of incubation varies from 4 ½ to 10 days according to the state of the weather, and the period of maturity from 8 to 16 days. Sexual differentiation takes place after the second moult, but copulation does not take place until after the third. Parthenogenesis has been observed to take place, the bulk of such offspring being males.

The mites live on the underside of the leaves protected by their webs, and gradually migrate from the lower leaves as they become damaged, to the higher portions of the vines. They do not hibernate on their hosts, but upon violets, mallow (*Malva passiflora*) and morning glory (*Ipomaea*).

Experiments showed that the average female mite can travel over 211 ft. of leaf surface in 10 hours and from 10 to 60 ft. over soil according to the texture. The writer has observed this mite to be almost omnivorous with regard to its host plants, and gives a list of 43 greenhouse and ornamental plants, 41 field plants, shrubs and trees, and 19 herbaceous plants occurring near hopfields, all of which this mite has been found to attack. From the wide range of plants in this list it seems probable that this pest is able to thrive on any form of vegetation in which the pubescence of the underside of the leaves is not so heavy or luxuriant as to prevent direct attack on the leaf tissue.

The first symptoms of attack are the appearance of yellow spots on the leaves. As the mites increase in number the leaves become more "speckled", turn yellowish, dry up and fall to the ground. The decrease in the vitality of the vine results in a premature ripening of the hop cones, decreased yield, and weakening of the roots. The male vines appear to suffer more severely than the female and are sometimes entirely defoliated.

Several insects have been observed preying upon the red spiders, but not in sufficient number to have much effect on the infectation. The most numerous insect was a small anthocorid bug (*Triphleps tristicolor* White). Certain small ladybirds have also been observed.

For preventive measure the writer has found that the cheapest and most convenient insecticide is flour paste (8-100) or a combination of lime-sulphur 36° Baumé (1-100) and flour paste (4-100). It is essential that the vines be thoroughly sprayed. These mites are not affected by any form of dry sulphur. Stripping the vines and burning the leaves is an excellent measure, but not reliable as a complete control. When the mites have reached above the point of stripping, spraying operation should be commenced immediately after stripping. A second spraying is also necessary 7 or 10 days later.

The cost of spraying the different liquids with a machine of 2 acres per day capacity works out as follows:

	Cost per acre
Stripping the vines	[illegible] to 9s
Spraying twice, each 300 gallons, with flourpaste (8 %) . . .	32s
Spraying twice, each 500 gallons	31s
Spraying twice, each 300 gallons, with mixture of lime sulphur (10 %) and flourpaste (1 %)	33s
Spraying twice with same mixture, using 500 gallons . . .	37s

Experiments with flour paste (8 ½ to 10 %) show that it is very effective in fixing the mites to the leaves, but as it has no effect on the eggs a second application is necessary. It is also quite harmless to the foliage and blossoms and does not interfere with the fertilisation of the cones.

It is useful against all attacks of red spider except on sweet peas, carnations, green house roses and plants having a heavy pubescence on the leaves.

The leaves of carnations and greenhouse roses are too smooth for the flour paste to adhere and the old method of washing with the garden hose remains the best method in this case.

Appended is a bibliography of 27 works.

1123 – A New Fruit and Truck Crop Pest (*Irbisia brachycerus* Uhler). – VOSLER, E. J. in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. II, No. 6, pp. 551-553. Sacramento, California, June 1913.

This pest was reported as a small black plant bug damaging the fruit of peaches and garden crops generally. Weeds of uncultivated land and garden vegetables, especially radishes and rhubarb, were found attacked. The absence of eggs and immature stages led to the conclusion that the insects had emigrated in search of food from other host plants that had been exhausted.

Owing to the large area of distribution, contact poisons would be useless and the writer recommended a good repellent such as Bordeaux mixture in place of an insecticide.

This capsid pest has been identified by Van Duzee as *Irbisia brachycerus* Uhler, which was redescribed as *Capsus solani* by Heideman.

1124 - **The Occurrence of Woolly Aphis *(Schizoneura lanigera)* in the Core of Apples.** — HEWITT, THOMAS R. in *Journal of Economic Biology*, Vol 8, No. 2, pp. 95-98 + 1 fig. London, July 1913.

In January the writer had occasion to examine some apples ("Newton Pippin") received from California by a Dublin fruit merchant. There was no external symptom of disease except for a slight mildewy appearance of the eye, but on cutting them in two, the cores were found to contain aphids which in three cases were alive. There was little damage done to the fruit, beyond a small channel connecting the eye with the core. In one apple the seeds were damaged, but in no case was the flesh injured.

The generation of the species in the *Schizoneura* is carried on chiefly by parthenogenetic females which hibernate on roots or in cracks in the bark during the winter months.

The specimens found in the imported apples were found to be adult females and larvae in different stages of development. This occurrence in the fruits is thus of considerable economic importance, for the importation of such infested apples affords the aphid an opportunity of gaining an entrance and establishing itself in fresh orchards in this country.

Another means of hibernation has been shown by E. M. Patch, who has proved that *S. americana* of the elm and *S. lanigera* of the apple are identical. She claims that the woolly aphis of the apple hibernates in the rough bark of the elm, which is the normal host plant of the sexual brood. Eggs are laid in the elm bark and give rise to virgin "stem mothers", which give birth to a second generation of wingless females. The offspring of these are the third generation, which acquire wings and migrate in the spring.

It is evident that the occurrence of a sexual brood in the apple is uncommon, but there is considerable uncertainty as to the identity of *S. ulmi* and *S. americana.* It would be interesting to know what genetic relationship exists between *S. ulmi* and *S. lanigera,* and if the migration which is known to take place in summer is to the elm or to other apple trees as generally believed.

1125 - **Collembola damaging Pine Trees.** — COLLINGE, W. E. in *Journal of Economic Biology*, Vol. 8, No. 2, p. 99. London, July 1, 1913.

Several species of Collembola have been known to be injurious to various species of roots and flowering plants and to act as carriers of fungus spores.

The writer has recently examined some diseased shoots of *Pinus sylvestris* and found that the damaged buds contained 5 or 6 specimens of a Collembolan which Prof. Carpenter identified as *Seira nigromaculata.*

The insect appears to be attracted by a resinous gum, and as the leaf bud opens, makes its way to the bases of the young leaves, causing the leaves to turn yellow and ultimately fall away. Sometimes the damage is only partial, but mostly the new buds are completely ruined.

As a preventative the scattering of napthaline round the base of the stem, or smearing with a sticky material in the autumn is recommended.

ALFREDO RUGGERI, gerente responsabile.

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.
ORIGINAL ARTICLES

The Present State of Agricultural Education in Austria

by

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In Austria, or rather in the countries represented in the Austrian Parliament (Cisleithania), agricultural education is imparted in technical agricultural schools and by travelling lecturers. These two forms of tuition are not sharply distinguished from each other, for often the teaching staff of the schools act as travelling lecturers, while some of the latter hold courses which resemble those given in the schools, differing from them only in being of shorter duration.

A. — Technical Agricultural Schools.

These schools date back to the eighteenth century. The first of them were started on the initiative of private persons, some of whom were large landowners who had recognized the necessity of technical agricultural instruction. With the development of agricultural cooperation, the cooperatives (even some of the smaller ones) founded schools of agriculture. Especially after the sixties, this movement became very active and most of the agricultural schools in Austria owe their origin to private initiative, chiefly that of agricultural associations.

At first some uncertainty prevailed as to the objects and extent of the new schols ; only later, in the seventies, did they begin to differentiate according to their several aims. As soon as a Ministry for Agriculture was created in Austria (in 1868) it took an especial interest in agricultural education. After consultation with the most competent persons and institutions the Ministry issued a series of decrees with the object of giving a first organization to agricultural education.

To that period is due the present distinction of higher, medium and lower agricultural schools. This sharp distinction distinguishes the Austrian agricultural school system from that of most countries, in only a very few of which this systematic graduation from the highest to the lowest schools has been adopted.

1. *Higher agricultural education.* — In Austria those institutes which give the highest scientific instruction in all the branches of agriculture, and which admit only those pupils who possess a good general preparation and the leaving certificate (Mittelschulmatura) of medium schools, are considered as agricultural colleges.

The subjects taught are not only the purely technical ones, but comprise also all those scientific subjects which concur in making up a higher culture. The course has a duration of four years and gives the necessary knowledge for managing large estates and for teaching in colleges and medium schools, as well as for scientific research work in agriculture; it also enables students of other professions to gain useful knowledge concerning the cultivation of the soil. At the end of the course there are three State examinations (Staatsprüfungen) to be passed. Besides this the students may obtain the academical degree of doctor in agriculture (Doktor der Bodenkultur) on presenting a thesis and submitting to severe examinations.

At present the following colleges exist in Austria:

1. Vienna (Hochschule für Bodenkultur), consisting of three sections: agriculture, forestry and rural engineering ; tuition is imparted in German.
2. Krakau, the agricultural section of the University of Krakau, in which teaching is in Polish.
3. Prague, at the Bohemian University, in which Czech is the language used.

All these three colleges are under the Ministry of Instruction.

Besides these completely equipped colleges there are also agricultural chairs at the following technical colleges: Vienna (German), Graz (German) Prague (German and Bohemian), Brünn (German and Bohemian) and Lemberg (Polish). The object of these chairs is to complete the instruction of the students of the technical colleges, especially of the engineering sections.

2. *Agricultural Academies.* — At first, besides the higher education in agriculture, there were only the medium and lower schools. Towards the end of last century an intermediate school has been introduced between the higher and the medium schools; it is called the agricultural academy and imparts instruction as in the colleges, from which it differs in that the course lasts two years, or if desired three years, instead of four. The academy admits pupils from the medium schools of general culture and also from agricultural medium schools.

There are at the present time three agricultural academies, which are regional institutions, and like all the following agricultural schools are under the control of the Ministry of Agriculture.

While the Colleges do not possess any farm attached to them, or only an experimental one, the agricultural academies have large farms for experimental and educational purposes, and they give their students the theoretical and practical knowledge required for the management of large estates.

3. *Medium Agricultural Education.* — The students who have been through the agricultural medium schools are also capable of managing large and moderate-sized estates, and they can, as well as those from the academies, on conforming to the regulations, become teachers in the lower agricultural schools. These medium agricultural schools are open to all who have passed the lower four classes of a middle school for general culture or all the classes of a secondary school (Bürgerschule).

Instruction in these schools is chiefly theoretical, but where possible practical tuition is also given, as almost all of them dispose of a completely equipped school farm. Students who have obtained their diploma may, upon passing an examination before a commission in the presence of a Government official, be admitted as one-year volunteers in the army.

There are at present in Austria nine medium agricultural schools; in four of these German is spoken, in four Bohemian and in one Polish. With only one exception they are regional institutions. There are, besides, two special schools, one of which is the Klosterneuburg higher school for vine and fruit growing, which is a State institution, and the other the horticultural school at Eisgrub, a private institution, but subventioned by the State and officially recognized.

4. *Elementary Agricultural Education.* — The number of lower agricultural schools is much greater than that of the above-mentioned schools. Their object is the spread of agricultural knowledge among the peasant population. At first there were only elementary agricultural schools for boys. Later such were opened also for girls.

In some schools for boys the course is a two-years one (Ackerbauschule), in others its duration is only of one or two winter half-years (Winterschulen).

The first are the oldest, and they receive pupils who possess the general education that is given in the primary shools (Volksschulen); theoretical and practical instruction (the latter on the school farm) are given. The object of these schools is to form a class of better educated peasants and also overseers and foremen for large estates.

The number of these schools is forty-two, of which thirteen are German, fourteen Bohemian, seven Polish, two Slovenian, two Italian and four bilingual.

The number of agricultural winter schools is constantly increasing, and among the schools for the peasantry they have proved to be the best. As these winter schools are open only during the five or six months of the worst season and as but few of them possess a school farm, the instruction given is mostly theoretical and includes subjects of general education as well as agriculture. The commencement of the courses is regulated according to the climatic conditions of the locality. In most of the winter schools a second winter course follows the first, so that in reality the course covers ten to twelve months.

In general such good results have been obtained with the two-course winter schools that at present the tendency is to found two-course winter schools and to convert into such the one-course schools. For admittance to them the pupils must possess the elementary knowledge given by primary schools. The pupils work during the summer, between the two courses, on their fathers' farms; with the present scarcity of rural labour this is a great advantage. After having frequented these schools they generally remain on their parents' farm, in the improvement of which they use the acquired knowledge, and at the same time set an example to their neighbours.

In 1913 there were 91 winter schools ; some are regional, others association or private institutions. There are, besides, some schools which are similarly organized, but which devote themselves to some special branch such as vine-growing or market gardening.

Such special branches are also treated in some lower schools in a one-years' course lasting ten or twelve months or less. Their object is to improve pupils in market gardening, fruit or vine growing, in the cultivation of flax or hops or meadows, and in dairying or other special branches of agriculture; consequently they have been founded where these particular forms of farming are prevalent. Their number is now 24.

5. *Agricultural Instruction for Girls.* — In the nineties the opinion began to gain grouhd that instruction limited only to boys was not sufficient, because in farming in general, and especially in some branches, the influence of the women in the family is very great. Thus the necessity of providing technical instruction for women also was recognized and the first housekeeping schools were founded with the object of teaching farmers' daughters the domestic management of a farm house, together with some notions of agriculture. These schools are not all of them organized on the same lines. There is one housekeeping school which bears the title of agricultural school for girls. In order to be admitted to it a fairly good preparation is demanded, such as is given by the secondary schools (Bürgerschule), training schools for teachers or high schools. Besides housekeeping it teaches agriculture systematically, the curriculum being about the same as in the practical schools of agriculture (Ackerbauschulen), so that the girls on leaving the school are not only qualified to manage a large farm household, but can also act as assistants on a farm or teach in agricultural housekeeping schools.

The other agricultural housekeeping schools, which demand as preparation for admission only the knowledge acquired in the elementary schools, are divided into those whose course extends over a whole year and those in which it is limited to five or six months.

Besides the above, there are also the so-called summer housekeeping schools attached to the agricultural winter schools. They have the same objects in view as the housekeeping schools and a similar curriculum, but they differ chiefly in the shorter duration of instruction (three to five months) as well as in the time of year during which they are open, generally from April 1.

The most important data on the agricultural schools as they were during the scholastic year 1912-13 are the following:

Institutions for Agricultural Education in Austria.

Institutions	**State**	**Regional**	**District or association**	**Private**	**Total**	**Staff**		**Number of students**	**Scholarships**	
						Perma-nent	**Assis-tants**		**Number**	**Yearby amount**
										£
Colleges and Sections of Universities.	3	—	—	—	3	1) *92*	(1) *58*	1) *1 631*	1) *147*	1) *2 774*
Academies.	—	3	—	—	3	52	19	342	64	2) 1 606
Medium schools.	1	8	1	1	11	97	60	1 274	103	1 172
Elementary schools	1	26	13	1	41	169	186	1 486	484	4 530
Agric. winter schools. . . .	—	55	33	3	91	251	610	3 370	921	2 753
Lower special schools . . .	—	19	14	1	34	110	99	868	240	1 794
Agric. housekeeping schools, with 2 years' course . . .	—	—	—	1	1	6	8	22	—	—
Agric. housekeeping schools .	—	4	13	5	22	100	63	630	44	3) 277
Total . . .	5	115	74	12	206	785	1 045	7 992	1 856	12 132

(1) In the expenses of the colleges those of the forest section and of the rural engineering sections of the Vienna agricultural school are included; for this reason these expenses are not comprised in the total.

(2) Including 12 free places.

(3) In the last budget only two extraordinary grants of £ 96 are included.

B. — TRAVELLING AGRICULTURAL LECTURESHIPS AND SPECIAL COURSES.

A regular agricultural school education is, under present conditions, available for only a limited number of intending farmers. Consequently it is sought to use other methods besides schools to promote the spread of agricultural instruction. These methods are travelling lectureships and special courses. The lectures are given either by travelling lecturers specially appointed for the purpose or by some of the teachers of agricultural schools, both classes of lecturers visiting in turn the various localities of a district.

While the travelling lecturers in the southern districts, such as Dalmatia and Illyria, which are less developed from an agricultural point of view, are appointed by the State, in all the other parts of the Empire they are officials of the independent local authorities or of the principal agricultural corporations and associations; nevertheless the State contributes in most cases to their salaries.

For all the crown lands, regulations have been drawn up for the carrying out of this service.

As the effect of a lecture is in general but slight, the lecturer is bound by the regulation to keep himself posted in the progress of his territory, to keep in touch with the rural populations and to assist the people with advice and action in any difficulty connected with farming.

Among the duties of the lecturer there is also the holding of courses, which may last a day or more, in order to instruct farmers, anxious to learn, in certain branches of agriculture, such as dairying, live stock keeping, poultry keeping, fruit tree grafting, forage growing, etc. Such courses are often held by teachers of the winter or other agricultural schools during their free time, either in the same schools or elsewhere, and contribute efficiently to the spread of modern farming methods. These courses are not limited to the men and boys only, but extended under the form of lectures on cooking and domestic economy to the women also.

All the members of the teaching staff, whether travelling or otherwise, must before being definitely appointed pass an examination as to aptitude for teaching. This examination is held at one of the colleges in Vienna or in Prague, and is divided into an examination for medium schools and one for lower schools. There are, besides, examinations for fruit and vine growing and for agricultural housekeeping schools. For these examinations there are special regulations drawn up by the Ministries for Education and for Agriculture.

As agricultural instruction in Austria is not all under one single control, but is managed partly by the State and partly by other bodies, such as local governments, district municipalities, associations and even by private persons, it is not easy to ascertain the amounts of the sums spent for this object. Nevertheless, from the following data concerning the expenses and contributions of the State, which form only a small part of the whole, some idea of the outlay may be formed.

The budget for 1913 contains the following figures:

1. In the budget of the Ministry of Instruction, under whose control all the Universities and Colleges are situated, consequently also the agricultural sections of the Vienna College, of the Czech Polytechnic of Prague, and of the University of Krakau, the allotments for agricultural instruction are not given separately, but only the lump sums for each institution. Nevertheless these figures show the amount of the contribution of the State for this branch of education.

In the budget for 1913 the estimates for the Vienna College are set down at £. 28356, of which about one half may be considered as devoted to the agricultural section. There is besides a special credit of £. 1742 provided. Higher agricultural education shares also for an amount which is not stated, in the sums voted for the Czech Polytechnic of Prague, *viz* £. 57078 ordinary expenses, and £. 18892 extraordinary ones, and in those of the Krakau faculty of philosophy, namely £. 31 450 Of these sums between one-fourth and one-third may be safely reckoned as being spent upon agricultural education. It is also to be noted that the cost of the chairs of agriculture at the Polytechnic schools of Vienna, Gratz, Prague, Brünn and Lemberg is also to be included in the sums spent on higher agricultural education.

2. In the budget estimates of the Ministry of Agriculture, upon which all the other schools of agriculture depend, the following figures are included:

1) For the State Institutes of Klosterneuburg, Spalato and Glavica, ordinay expenses	£	10 046
Extraordinary do	»	83
Total . . .	£	10 129
2) For grants to agricultural schools not belonging to the State, as well as for travelling lectureships and special courses, ordinary expenses	£	28 750
Extraordinary do	»	15 000
Total . . .	£	43 750
3) For the spread of means for agricultural instruction, for scholarships, subventions, travelling expenses, expenses for State inspectors of subventioned schools, for the commissions of examiners of teachers of agriculture and forestry, ordinary expenses . . .	£	8 333
4) For travelling lecturers and special courses, which are partly (in Dalmatia and Illyria) instituted by the State and to a greater extent by the local Governments and by the principal agricultural associations, further for the cost of agricultural instruction to soldiers and for the upkeep of model farms, ordinary expenses	£	15 417
Extraordinary do.	»	4 167
Total . . .	£	19 584

According to the above the total outlay of the State for agricultural education, excepting college education, is:

1) For State Institutions,	£	10 129
2) For subsidizing institutions not belonging to the State . . .	»	43 750
3) For general agricultural education.	»	8 333
4) For travelling lectures and special courses	»	19 583
Total . . .	£	81 795

From these figures it may be seen that the State takes a special interest in agricultural education; by comparing them with those of the previous years it will be seen how rapidly the outlay for this object has increased. This increase is explained not only by the increased number of institutions (thus for instance, in 1912, eight new ones have been opened), but also by the greater demands of efficiency made upon them.

Recent Work of the Bacteriological Section of the Central Agricultural Experiment Station at Experimentalfället, near Stockholm

by

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Chief of the Section.

The Bacteriological Section undertakes research and experiments on agricultural microbiology in general. This work includes the bacteriology of the soil, of manure and of dairy produce ; the subjects are often treated in conjunction with other sections of the Institute.

The work on soil microbiology has been concerned with methods of investigation, and more recently with the influence of organic substances on nitrification and denitrification in the soil. Just now, the decomposition of farmyard manure in the soil, both alone and in presence of lime, is occupying attention. The changes of a biological nature induced in the soil by farmyard manure have so far been insufficiently explained.

In colloboration with the Botanical and Agricultural Sections, numerous trials have been made with different cultures of Leguminous-nodule organisms, such as Bottomley's "Nitrobacterin", Simon's "Azotogen", and cultures prepared by us. "Nitrobacterin" contained no living *B. radicicola*, and consequently produced no effect ; "Azotogen" gave very good results and the results of experiments with the cultures prepared in our own laboratory were likewise satisfactory.

On the subject of the fermentation of farmyard manure, work has been undertaken in collaboration with the Agricultural Experiment Section on the possibility of preserving the ammoniacal nitrogen of the manure by the addition to it of whey from cheese-factories. Some years ago I found that the common lactic ferments occurred in great numbers in farmyard manure ; by supplying them with carbohydrate material, such as milk sugar, one ought to get a fermentation in which the acids produced fix the ammonia of the manure, thus preventing the usual loss of nitrogen in this form. Chemical and bacteriological analyses, as well as field trials carried out by the Agricultural Section of the Institute, have shown that this treatment of manure (0.25 and 0.5 per cent. of milk sugar being added) has the expected effect, and the manure gives considerable increase of crops over manure kept in the ordinary way.

Bacteriological work on dairy questions has also taken up a good deal of time.

Firstly, a satisfactory method for judging the quality of dairy milk from the hygienic standpoint was sought for. The reductase test was found to answer the requirements in this case. It is very easy to carry out and gives a very fair approximation of the number of micro-organisms present in a milk. The result has been that the method has spread widely, both in Sweden and in other dairy countries. In the Swedish dairies, where the price of milk is now beginning to be fixed on its hygienic qualities, as well as its fat-content, the reductase test is used as the basis for the former.

Other work was dealt with: anaerobic organisms of milk and butter; resistance to heating of tubercle bacilli in whey (in view of a projected measure on compulsory pasteurization of waste dairy products); biology of the lacto-bacilli, especially with regard to the part they play in the ripening of cheeses; influence of different methods of pasteurization on the microflora of milk; bacteria of slimy milk.

These researches are often not confined to the bacteriological laboratory, but are also made in various dairies, so as to bring them under the conditions of practice.

Besides this work, of which the results have been published in the Bulletins of the Central Institute, as well as in various scientific journals in other countries, a great number of bacteriological analyses have been made free of charge on samples of milk, butter, cheese, water used in dairies, soils, etc., sent in by private persons. Consultations on questions of agricultural microbiology are also given free.

Organization of Field Experiments in Denmark

by

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Experiments on crops have been carried on in Denmark since the middle of the nineteenth century. When the *Royal Agricultural and Veterinary College* ("Den Kgl. Veterinaer og Landbohøjskole") was founded about that time, 25 acres of the land belonging to it were set apart as an experimental field; on this experiments were begun on a plan similar to that of the Rothamsted Experimental Station. These experiments went on for more than thirty years. From 1882 to 1903, a Commission nominated by our *Royal Agricultural Society* ("Det Kgl. Danske Landhusholdningsselskab") carried on extensive experiments on cereals, particularly wheat and barley; these were made in various parts of the country and were aimed at determining: the varieties best suited to the climatic conditions of the country, best date for sowing, amount of seed, time of harvest, method of harvesting, etc. In 1894 *Local Agricultural Societies* began experiments on the land of their members, practical farmers; this work has extended so much that each year more than 2000 experiments are made, under the auspices of about 120 societies in all parts of the country. The results of these experiments are generally only of local value, and indeed are often only applicable to the field in question; in the earlier years they were mostly concerned with the use of chemical manures and the manurial requirements of the soils; later they were extended to almost all points of field practice. By statistical elaboration of the mass of material for each year's experiments, the results have been made useful in various branches of agriculture in a way that was not previously possible.

The *Government crop experiments* ("Statens Førsøgsvirksomhed i Plantekultur") were begun after 1870 by P. NIELSEN, State consulting specialist, under the auspices of our Royal Agricultural Society. They are essentially based on *fixed field experiments*, whose results, separately or combined, can be considered of value for the whole country, or at any rate for large areas. This branch was made into an independent State institution in 1886 by the establishment of an exprimetal station at Tystofte.

The following *permanent Government crop experiment stations* now exist:

1. *Tylstrup*, in northern Jutland (Vendsyssel); established in 1894; area — 91 acres of sandy soil, 91 acres of fen (*Carex* moor), 128 acres of peatmoor (*Sphagnum* moor).
2. *Studsgaard*, in central Jutland; established in 1906; area — 111 acres of light sandy soil ("grass heath"), 37 acres of sandy soil at *Borris* (western Jutland), 27 acres of fen, 54 acres of peatmoor near *Herning*.
3. *Askov*, in southern Jutland; established in 1886; area — 57 acres of clay, 17 acres of sandy soil, 15 acres of peatmoor.
4. *Aarslev*, in Fünen; established in 1905; area — 82 acres of clay.
5. *Lyngby*, in north-east Zealand; established in 1890; area — 128 acres of clay.
6. *Tystofte*, in south-west Zealand; established in 1886; area — 74 acres of clay.

The *sub-stations* are as follows: *Abed*, in Laaland (5 acres of good clay), and *Aakirkeby*, in the island of Bornholm (7 ½ acres of heavy clay).

Temporary experiments, made on a fairly large scale, comprise: growing of root crops, diseases of plants and their control.

With these experiments are combined chemical, botanical and bacteriological researches, carried out in the *State Field-crop Laboratory* ("Statens Planteavlslaboratorium") at Copenhagen, as well as in the *chemical laboratories* of the permanent stations.

The *Danish Seed Control* ("Statsanstalten Frøkontrol") was established by the State in 1871; this institution assists in the experiment work by controlling the seed used in the trials.

In the *State experiments*, the method to be followed is fixed especially with regard to the *position of the stations* and the nature of their land. As mentioned above, three of the six permanent stations are in Jutland and three in the large islands, while the smaller islands have two sub-stations. The country is thus divided into naturally bounded districts, in which the soil and climate are in agreement with those of the station; in each district the land for the experiments has been chosen to have soils as typical as possible for the regions under consideration (clay or sand, fen or moor).

As the results of the experiments carried out at each station depend essentially on the soil and climate, this method guarantees them the greatest possible value for the agriculture of the district; and as they are, owing to their nature, carried out simultaneously at several or all of the stations, the conclusions drawn from them rest on as wide and solid a base as possible. This is particularly important in comparative trials with different varieties of crops and in experiments on seed yield, time and method of sowing, cultivation, rotations, etc.

Before a piece of land is selected for experiments, the conditions and evenness of the soil are very carefully gone into; uniformity is an indispensable condition of land for experiments. Numerous samples of soil and subsoil are taken according to a pre-arranged plan and at definite distances apart; these are judged and submitted to physical and chemical examination. When the experimental ground has been chosen, the whole is given a trial cultivation by the same methods and under the same crop, generally for several years, so as to work out any possible irregularities due to previous cropping; the soil is thus made uniform. At the same time, the uniformity is tested by weighing the produce of plots not larger than those which will eventually be laid down. The large amount of material obtained from these preliminary investigations allows a very exact estimation of the evenness of the land to be obtained, and serves for the arrangement of the experiments, the classification of the soils, and the setting-out of the fields and plots for the different experiments. The management of the plots is also arranged so that any differences due to the experiments themselves are equalized before fresh experiments are started.

In Denmark, as elsewhere, the disturbing influence of variations in fertility is further guarded against by arranging a large number of parallel plots, arranged in size, shape and position in such a way that their average fertility may be supposed to be the same as that of the whole field. The number of parallel plots is generally from 6 to 12; for manuring experiments they cover 4 to 2 rods ($^1/_{40}$ to $^1/_{80}$ acre); for trials of various seeds and crops, 2 rods to 12 sq. yds. ($^1/_{80}$ to $^1/_{400}$ acre); for pasture plants, 1 rod to 6 sq. yds. ($^1/_{160}$ to $^1/_{800}$ acre). The smaller the resulting figures from an experiment, and the less the evenness of the land, the greater must be the number of parallel plots. With variety- trials the number often reaches 16, and sometimes exceeds 20 (1). The influence of two adjacent plots on one another may be avoided by establishing a sort of protecting belt all round the plot, and weighing only the produce from the part thus enclosed.

The exactness of working may be examined and checked by a calculation of the probable error on the materials used, and this can be made as well while the experiments are in progress as when it comes to working up the results for publication. But nothing is published till the results admit of no possible doubt. The experiments are carried on for at least five years, and often for a much longer period before the results are considered fit for publication. Experiments on manuring for rotations thus last over two or three courses, making 16 to 24 years. In this way the influence of the different seasons is largely eliminated, in most cases a necessary condition for obtaining reliable results.

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(1) In working with different varieties of cereals, the seed samples are all taken from the same spot and under similar conditions. In root crops, especially in comparing varieties, the percentage of dry matter is considered as of prime importance; to determine this four average samples are taken from each parallel plot for each variety, each sample consisting of at least fifty roots; all these roots are cut across four or five times to get a pulp for analysis. The dry matter is calculated from the mean of the four analyses.

The organization and direction of the State activity as regards experiments is under the control of the Ministry of Agriculture. The *permanent Experiment Stations* are organized as ordinary farms as far as the experimental work permits. Each station is under a *director of experiments;* further, two such directors have charge of the temporary experiments. The directors engage the staff and are nominated and dismissed by the Minister of Agriculture on the advice of the *State Commission for Field Crops* ("Statens Planteavlsudvalg"). This Commission acts as intermediary betweenn the Minister and the State activity on field crops ; it sits at Copenhagen and is composed of three members nominated respectively (subject to the approval of the Minister) by the Royal Agricultural Society (whose delegate acts as Chairman), by the governors of the Royal Agricultural and Veterinary College and by the Agricultural Societies which cooperate in the work.

The Budget fixes every year a detailed *plan of work* for the State experimental activity, with details for carrying out the experiments and researches proposed ; these number over 200 each year. The directors of experiments discuss the experiments to be made with the representatives of the local experimental organization and also with those of other institutions which collaborate in the work ; they then together make up a plan of work, which is sanctioned by the State Commission after joint discussion and possible revision ; after this the directors are solely responsible for carrying them out. A copy of the results is sent in each year to the archives of the Commission and is used for the working out of the results. The directors themselves undertake this work ; for each series of experiments a *reporter* is nominated; when the series is finished he balances the results and draws up his report. This report is agreed to by all the directors and then published by the State Commission in the *Annals of the Production of Field Crops ;* this is the organ of the experimental activity, and is edited by the secretary of the State Commission. *Summarized popular reports*, drawn up in the same way, are published as special leaflets and in the newspapers, to bring the results of the experiments before farmers ; they are distributed free in large numbers in railway stations and agricultural schools, and at meetings, shows, etc. These summaries are also published in the *Annals*, which also give reports and extracts of reports on the local experimental work, control of Danish seeds, etc. (1).

The *organization and direction of the local experimental activity* is undertaken by the local Agricultural Societies or their federations. The plans are elaborated and directed by *Local Crop Commissions* and are carried out by the consulting specialists named by them, or at any rate with the assistance of these. The different Local Commissions in each Province work together, holding a joint meeting once a year; at this meeting a complete report on the results of the experiments made in the province is presented, and the problems and plans for the experiments of the coming year are discussed. The four Provinces of Jutland, Fünen, Zealand and Laaland-Falster, each have also a Crop Commission nominated by the societies cooperating in the work, with a consulting specialist for the subject. These *Provincial Crop Commissions* direct the joint work of the Local Commissions, collect and publish their reports, and through their consulting specialists organize and direct the experiments and researches of special interest for the province or the country in general. In the case of experiments of general interest the matter is discussed at the annual meetings of the Provincial Commissions and between these and the State Crop Commission, the State directors of experiments, etc.

The *annual State grants* are as follows: for the State experimental activity, about 200 000 crowns (£11 000); for the local experimental activity, about 100 000 crowns (£5 500). The latter is allotted on condition that the Societies themselves contribute more than one-half of the total expenses of the experiments.

The Possibility of Replacing Stassfurt Potash Salts by Finely Ground Phonolite, Leucite, etc.

by

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CONSUMPTION AND EXPORTATION OF STASSFURT POTASH SALTS.

Before examining the question of the possibility of replacing the Stassfurt potash salts by other minerals it is necessary to know what quantities of these salts are produced and consumed.

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(1) Subscriptions for the *Annals* may be sent to the "Gyldendalske Boghandel", Copenhagen; the price for one volume (yearly) is 6 crowns (6s 7d).

The total production of potash salts (crude) in Germany was (1):

In 1910 . . . . 8 031 838 tons
In 1911 . . . . 9 553 144 ”

The manufacture of concentrated salts from the crude material during the same years and in the same country was as follows (2):

Year	Chloride of potash	Sulphate of potash	Sulph. of potash and magnesia calcinated 48 %	Potash salts for manure	Sulph. of potash and magnesia 40 %	Kieserit in blocks	Calcinated ground kieserit
	tons	tons	tons	tons	tons	tons	tons
1910	427 382	91 735	40 873	516 581	105	29 382	742
1911	436 352	108 383	48 239	635 522	141	29 700	704

The quantities used in Germany for agricultural purposes were the following (2):

Year	Crude salts	Containing pure potash	Manufactured products	Containing pure potash	Total	
					Salts	Potash
	tons	tons	tons	tons	tons	tons
1910	1 923 623	249 646	261 176	104 012	2 184 800	353 658
1911	2 168 335	285 294	324 739	130 374	2 493 074	415 669

The quantities of crude salts exported amounted to (2):

In 1910 . . . . 1.16 million tons
In 1911 . . . . 1.13 ” ”

The greatest quantity (709 600 tons in 1910 and 631 900 tons in 1911) was exported to the United States. Next in importance are the Netherlands with 140 700 tons, followed by Russia with 67 000 tons.

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(1) According to Dr. M. HOFFMANN: *Arbeiten der Deutschen Landwirtschafts Gesellschaft*, 1910, Part 216.

(2) According to Dr. Hoffmann : *loc. cit.*

The quantities of chloride of potash exported were (1):

In 1910	266 000	tons
In 1911	325 000	"

The chief importing countries were:

	In 1910	In 1911
United States	177 000	219 500
France	34 400	39 100
England	14 600	13 900
Spain	8 600	11 700

The exports of sulphate of potash were (2):

In 1910	74 800	tous
In 1911	108 000	"

The following quantities were shipped:

	In 1910 — tons	In 1911 — tons
To the United States	39 070	56 100
" France	8 560	14 860
" Spain	3 250	5 610
" Ceylon	2 230	3 710
" Japan	414	1 480
" Algiers	1 052	1 820

The amounts of sulphate of potash and magnesia exported in 1911 were (2) 278 500 tons, of which 140 700 tons went to North America, 44100 tons to the Netherlands and 31 500 tons to Sweden.

The table on the next page shows the quantities of potash consumed in the whole world (3):

From the above statistics it will be seen that very considerable quantities of Stassfurt salts are used and that their consumption is on the increase.

Besides the so-called Stassfurt salts which contain potash in a soluble form (KCl or $K_2 SO_4$) and which hitherto have been found and worked in large quantities only in Germany, other minerals containing potash are met with in considerable masses in other parts of the globe. Such are various silicates containing potash: phonolite, leucite, sanidine, muskovite, orthoclase, etc. For a long time past attempts have been made to use these minerals as manures.

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(1) According to Dr. GROSSMANN Die Ernährung der Pflanze. — *Illustr. Halbmonatsschrif* Year VIII (1912), No. 6.

(2) According to Grossmann, *loc. cit.*

(3) According to Dr. Hoffmann, *loc. cit.*

Country	Total potash in tons	Consumption in lbs. per acre
1. Germany	353 835	9.123
2. United States	241 351	1.301
3. Belgium	8 845	4.241
4. Holland	28 934	12.898
5. France	22 482	0.619
6. England	9 778	1.291
7. Scotland	5 804	3.561
8. Ireland	2 754	1.157
9. Austria	11 628	0.735
10. Hungary	1 321	0.068
11. Switzerland	2 733	1.105
12. Italy	5 512	0.308
13. Russia	14 318	0.100
14. Spain	7 232	0.297
15. Portugal	778	0.154
16. Sweden	16 364	4.240
17. Norway	1 733	2.741
18. Denmark	4 298	1.524
19. Finland	966	0.783
20. Other countries	14 282	—

VALUE OF PHONOLITE AS MANURE.

Of late especially, efforts have been directed towards the introduction of phonolite into agricultural use, for it was believed that it could compete with the so-called Stassfurt salts; as quite recently many experiments have been conducted to ascertain the foundation for the above belief it is now possible to give an opinion based on facts as to the real value of this mineral. Phonolite is a leucitophyre and consists chiefly of nosean, sanidine, nepheline, leucite, augite and biotite. It contains an average of 9 to 10 per cent. of total potassium (of which 33 per cent. is soluble in hydrochloric acid, while only traces are soluble in water), 6 to 8 per cent. of sodium, 2 to 3 per cent. of lime and magnesia, 25 per cent. of oxide of iron and alumina and 50 per cent. of silica.

When phonolite meal was placed on the market, a number of papers were published, especially by WEIN, with the object of demonstrating the good effects of phonolite. As the cause of their useful action, said to be equal to that of the Stassfurt salts, the easy weathering of the stone was mentioned as rendering potash available in sufficient quantities.

But many control experiments carried out by impartial workers have failed to confirm these favourable results.

When PFEIFFER and his collaborators (1) compared the effects of phonolite with those of sulphate of potash by means of pot experiments in sandy soil, they obtained the following results. The figures refer to the excess of crop over the pots left without potash manures.

							ratio
By	1 gm.	of K_2O as	K_2SO_4 :	29.49	gms. of oats	± 2.49	100
»	1.087	» »	phonolite :	11.82	» » »	± 2.81	40
»	2	» »	K_2SO_4 :	40.33	» » »	± 2.84	100
»	2.174	» »	phonolite :	19.75	» » »	± 2.29	49

According to the above the utilization of the potash contained in phonolite was much inferior to that in the sulphate of potash, being as 9.7 to 88.2. Similar results had been already obtained by other experimenters.

Thus WAGNER (2), in pot experiments comparing sulphate of potash and phonolite for rye-grass, found the following quantities of excess crop over the controls without potash :

				On sandy soil		ratio	On peaty soil	ratio
By	2.5 gm	K_2O as	K_2SO_4 :	21.9	gm.	100	73.2	100
»	2.5 »	»	phonolite:	10.1	»	46	24.1	33
»	3 »	»	K_2SO_4 :	29.3	»	100	85.6	100
»	3 »	»	phonolite:	8.5	»	29	39.2	46

The utilization of potash was as 100 : 11 on sandy soil and as 100 : 14 on peaty soil.

SCHNEIDEWIND (3) also found throughout a considerably smaller effect of phonolite in comparison with chloride of potash. The ratio of the effects of equal quantities of potash given under the forms of chloride of potash and of phonolite were as follows :

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(1) PFEIFFER, BLANCK and FLÜGEL : Die Bedeutung des Phonoliths als Dungemittel. *Mitt. des Landes Instit. Breslau*, Vol. VI, Part 2, 1911.

(2) *Deutsche Landw. Presse*, p. 1, 1909.

(3) Versuche über die Wirkung des Kainits 40%iger Kalisalze und Phonolite. — *Arbeiten der Deutschen Landwirtschafts Gesellschaft*, 1911, Part 193.

	Chloride of potash	Phonolite
Potatoes	100	33.9
Spring wheat	100	34
Mixed clover and grasses	100	20.3

The utilization of the potash contained in the two manures was the following :

	Chloride of potash	Phonolite
Potatoes	100	24.7
Spring wheat	100	4.1
Mixed clover and grasses	100	10.8

Experiments on vegetation carried out by HEINRICH and HONCAMP (1) showed that the effects of equal quantities of potash under the form of 40 per cent. potash salts and of phonolite were respectively as follows :

	40 % salt	Phonolite
Barley (grain)	100	36
» (straw)	100	36
Peas (grain)	100	31
» (straw)	100	42

The utilization of the potash in the phonolite was with barley 14 per cent. and with peas 20 per cent. of that of the 40 per cent. potash salt. All these careful experiments show that the potash contained in phonolite has undoubtedly a certain action, but that this is notably inferior to that exerted by easily soluble potash salts.

The results obtained by the easily soluble potash salts, contrary to the statements of interested parties, are not attained when phonolite is not mixed with the soil but given as a top dressing, as, for instance, was done in Pfeiffer's experiments. As for the other available trustworthy experiments they do not offer data differing to any extent from the preceding ones.

In the open field phonolite does not in any way have the same effects as the Stassfurt salts. This is clearly shown by the experiments made by SCHNEIDEWIND (*Arbeiten der Deutschen Landwirtschafts-Gesellschaft,* 1911, Part 193), TACKE (*Protokoll der* 64 *Sitzung der Zentralmoorkommission* 1910, and *Illustr. Landw. Zeitung* 1910, No. 3), v. FEILITZEN (*Mitt. der Deutschen Landw. Gesellschaft,* 1910, page 145), HILTNER and LANG (*Prakt. Blätter f. Pflanzenbau,* 1909, Parts 10 and 11), POPP (*Mitt. der Deutschen Landw. Ges.,* 1909, p. 724), etc. Thus for instance Hiltner and Lang determined that the effect of equal quantities of potash given to oats under the form of 40 per cent. potash salts and of phonolite stood in the ratio of 100 : 22 to 60 (according to the other fertilizers applied at the same time); when given to potatoes the ratio was 100 : 8 to 30 (according to the other fertilizers used at the same time).

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(1) Vergleichende Untersuchungen über die Düngerwirkung von 40 %igem Kalisalz Kalisilicat, etc. — *Mitt. der Deutschen Landw. Ges,* 1910, No. 45.

Popp found that in an average of three years the effect of Stassfurt salts stood to those of phonolite as 100 : 26 to 31, and in another experiment lasting four years as 100 : 26 to 28.

It was thus demonstrated that in the open field, as in pots, the utilization of potash when given as phonolite was considerably less than when given as Stassfurt salts.

TACKE's field experiments showed that potatoes on sandy soil utilized 26.9 per cent. of the potash of 40 per cent. potash salts, and only 1.2 per cent. of that of phonolite (ratio 100 : 4.5); he showed further that with moor oats on moor soil the ratio of utilization was as 100 : 22 and that with potatoes on moor soil it was as 100 : 24.

In some isolated cases (observed by Popp) the effect of the potash in phonolite was found to be equal, and even superior. to that of the potash in Stassfurt salts. But these results, as well as their opposite in which phonolite either exerted no action at all or was positively injurious, have no significance; they are in the most favourable cases quite exceptional and most probably due to chance caused by the imperfection of field manuring experiments.

The conclusion drawn from both pot and field experiments, namely that phonolite has a certain action but that this is inferior to that of Stassfurt salts, agrees with its petrographic mineralogical composition. One of the chief components of phonolite, and at the same time the richest in potash, is sanidine, which is decomposed with difficulty: the potash of this mineral is not attacked by hot concentrated hydrochloric acid. Nosean and nepheline are more easily decomposed, but they are poor in potash and rich in soda. Leucite is more easily decomposed, and weathered than sanidine; thus the potash available for plants would appear to derive from leucite and nepheline, while the chief potash-bearing mineral, that is sanidine, is hardly to be considered as a source of potash for vegetation.

From this composition of phonolite it can be further concluded that the easy weathering attributed to it is due to the minerals nosean and nepheline, which, however, contain but small quantities of potash. The easy weathering of phonolite, upon which so much stress is laid, can only to a very limited extent cause a rapid action of potash.

VALUE OF FELDSPAR AS MANURE.

For a long time past feldspar has been considered as a possible manure. Thus W. KNOP in his treatise of agricultural chemistry (1868) at page 188 said that it was not unlikely that some day feldspar would be used as a fertilizer. It was also believed that its potash was easily assimilable by plants; but experiments carried out with this mineral have shown that the manurial effect of the potash-containing feldspars is very slight (1), as the following experiments prove.

Heinrich and **Honcamp** (see foot-note) found that the fertilizing effects of equal quantities of potash given under the forms of 40 per cent. potash salts, of phonolite and of feldspar were as in the following table, in which the quantities produced above those of the control plot are given :

	Straw	Ratio	Grain	Ratio
1. *Barley*				
40 per cent. potash salt	348.2	100	343.8	100
Phonolite	136 2	39	124.8	36
Feldspar	60.2	17	25.2	7
2. *Field peas.*				
40 per cent. potash salt	204.7	100	94.3	100
Phonolite	85.9	42	29.2	31
Feldspar.	27.1	13	10.3	11

As for the utilization of potash, if that, of the 40 per cent. salt be made equal to 100, then the utilization of phonolite by barley was = 14 and by field peas = 20 ; while the utilization of feldspar by barley was = 4 and by field peas = 7.

This inferior effect of feldspar (orthoclase) compared with that of phonolite (leucitophyre) is in harmony with the lower solubility of the potash of orthoclase in water containing carbonic acid and in ammonium chloride solution as compared with that of the leucitophyre potash; this as has been determined by R. **Müller**, K. **Glinka**, H. **Stremme** (2) and others. A series of experiments made under **Prianishnikov**'s direction show that all the minerals of the feldspar group possess only a very low potash effect, as may be seen from the following figures :

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(1) Manuring experiments with feldspar have been conducted, among others, by:

C. v. **Feilitzen**: *Svenska Moorkultur Förenings Tidskrift*, 1891 (quoted by **Blanck**, *Zeitschrift d. Landw. Kammer f. Schlesien*, 1913).

L. F. **Nilsons**: *Landtbruks Akademiens Handlingar och Tidskrift*, for 1889 (quoted by Blanck, *loc. cit*).

J. **Sebelien**: *Tidskrift för det Norske Landbrug* XIII, 1901, p. 69 (quoted by Blanck, *loc. cit.*).

D. **Prianishnikov**: *Landw. Versuchsstation*, Vol. 63, 1906, p. 151 ; Vol. 77, 1912, p. 399.

R. **Heinrich** and F. **Honcamp**: *Mitteilungen der Deutschen Landw. Ges.*, 1901 Parts, 4 and 5.

(2) H. **Stremme**,: Die Verwendung des Leucitophyrs als Kalisilikat. — *Kali, Zeitschrift für Gewinnung der Kalisalze*, 1912, Part 7.

	Without potash	With orthoclase	With microkline	With sanidine	With KCl (normal culture)
Oats	5.33	4.56	5.61	4.66	22.96
Buckwheat	1.50	2.40	1.95	1.88	14.95
Vetches	2.05	2 45	2.65	4.65	13.85

Thus the potash feldspars (orthoclase, sanidine, microkline are the feldspars richest in potash) can compete with the easily soluble Stassfurt salts still less than the leucitophyres (phonolite).

VALUE OF FELDSPAR-LIKE MINERALS (LEUCITE, NEPHELINE) AS MANURES.

It is well known that leucite (silicate of potash and alumina) is relatively easily weathered. Owing to the circumstance that leucitic rocks are found in considerable quantities in Italy, the question of using leucite for manurial purposes has been investigated for some years past in that country (1). **MONACO** (2) has used for this purpose the fairly decomposed rock, containing leucite, of Orchi on the volcano of Roccamonfina, ; he examined its solubility in various substances but did not obtain any very favourable results.

The manurial experiments directed by **PRIANISHNIKOV** (3) with leucite have confirmed the above results and shown the not very satisfactory effect of leucite as a source of potash, as may be seen from the following figures :

(1) It may here be mentioned that in Italy leuciticbasalt has been worked for leucite by separating the non-magnetic minerals, leucite and potash-mica (feldspar) from the magnetic silicates of iron and the basaltic magma, by means of magnets. The non-magnetic product contains an average of 30 per cent of leucite. The cost of preparation is about 17 shillings per ton (cf. LANGGUTH, Leucit ein Rohstoff für Kali- und Aluminiumdarstellung : (*Zeitschrift für prakt. Geologie*, 1905, p. 80, quoted by Stremme, *loc. cit.*). Recently in Italy this method of obtaining leucite is again raising interest.

(2) E. MONACO: Sull'impiego delle roccie leucitiche nella concimazione. *Le stazioni sperimentali agrarie italiane*, Part 7, pp. 577-583 (Modena, 1903). Cf. Stremme, *loc. cit.*

(3) PRIANISHNIKOV: *Landw. Versuchsstation.*, Vols. 63 and 77.

Crop	Without potash	With leucite	With KCl
Millet I	3.12	3.25	29.24
Oats	4.78	4.81	12.15
Wheat	2.75	4.05	6.40
Millet II	4.5	8.27	48.68

According to Prianishnikov, nepheline gave better results than leucite. As on the shores of the White Sea there are great masses of this mineral, which, provided there were cheap means of transport, could perhaps be used in agriculture, **Prianishnikov**, at M. Fedorov's recommendation, caused experiments to be made with this mineral. The following results were obtained:

Crop	Without potash	With nepheline	With KCl
Buckwheat	1.70	17.60	17.60
Millet	3.70	23.50	34.95

According to these experiments and others made by Prianishnikov's pupils, some of which, however, have to be accepted with some reserve, it appears that nepheline is capable of yielding good results as a source of potash. Further experiments on the action of leucite and of nepheline are desirable to clear up the question finally.

According to Prianishnikov's data the chief mass of the nepheline mineral consists of nepheline, biotite and apatite; further experiments of Prianishnikov may show that the good effects of nepheline mineral are not due principally to its content of nepheline (elaeolite) but to the biotite it contains.

VALUE OF MICAS AS MANURES.

Both potash mica (muscovite) and magnesia mica (biotite) have a relatively high potash content.

The researches of PRIANISHNIKOV (1), BIELER-CHATELAN (2), J. SAMOJLOFF (3), E. BLANCK (4) tend to show, contrary to the generally received opinion, that the potash contained in mica is more available to plants than that contained in feldspar.

According to Prianishnikov's experiments the effects of potash mica compared with those of potash feldspar were the following:

Potash fertilizer	Crop of barley	Potash fertilizer	Crop of oats
Control without potash . .	1.66	Control without potash . .	1.65
Mica, simple dressing	3.93	Orthoclase	—
» double »	6.37	. . . .	—
» four-fold »	10.27	» four-fold dressing	2.25
. . . .	—	» six-fold »	3.50
» eight-fold	15.10	» eight-fold »	3.62
Chloride of potash, simple dressing	22.17	Chloride of potash, simple dressing	15.10

Blanck observed that magnesia mica or biotite, the potash content of which ranges from 3 to 11 per cent., is superior as a potash manure to potash mica or muscovite, which contains 8 to 10 per cent. of potash.

The above are the chief rocks and minerals which might eventually be used as potassic fertilizers. The researches mentioned in the preceding pages prove that, as far as present observations reach, their manurial effect is considerably inferior to that of the so-called Stassfurt salts and that at present at least they cannot be discussed as substitutes for the latter. At most some of them may eventually acquire local importance.

The nepheline examined by Prianishnikov seems perhaps to be more effective than the other silicates of potash, but its potash content is only 3.88 per cent. Prianishnikov arranges the various minerals according to order of merit as potash manures as follows: nepheline, mica-schist, biotite, philipsite and muscovite, elaeolite, leucite, apophyllite, sanidine, orthoclase, microcline.

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(1) PRIANISHNIKOV: *loc. cit.*

(2) BIELER-CHATELAN: *Compt. Rend.*, 1910, Vol. 150, p. 1152 (quoted by Blanck, *loc. cit.*).

(3) J. SAMOJLOFF: *Zentralbl. f. Mineral* etc., 1910, p. 261 (quoted by Blanck, *loc. cit.*).

(4) E. BLANCK: *Journal für Landwirtschaft*, 1912, p. 97.

Though the above order is not perhaps based on thoroughly reliable experiments, yet in the main it is correct and shows that the feldspars richest in potash are the worst sources of potash, for, as is well known, the decomposition of feldspar diminishes inversely with its potash content.

In the above considerations I have not taken into account the conditions of price, as a general comparison can not be made.

COMPARISON OF THE PRICES OF POTASH IN PHONOLITE AND IN STASSFURT SALTS.

Such a comparison can only be made with some degree of precision in the case of phonolite, as this mineral is already on the market as a potash manure.

The prices of one pound of potash in the forms of kainit, 40 per cent. Stassfurt salts and phonolite are as follows:

Part of Germany	Kainit — pence	40 % salt — pence	Phonolite — pence
West: Cologne, 1910 (1)	0.889	0.940	0.801
Centre: Bernburg, 1911 (2)	0.534	0.828	1.394
» Giessen » »	0.700	0.876	1.031
North: Oldenburg, 1912 (3)	0.892	0.935	1.260
East: Danzig, 1913 (4)	—	0.908	2.403

Thus it is only in the immediate vicinity of the place of production that phonolite can compete with the Stassfurt salts. But even there, if the manurial effect of the mineral be considered, its use does not seem to be profitable.

EXPERIMENTS WITH THE OBJECT OF IMPROVING THE ACTION OF THE MINERALS.

Attempts have been made to improve the effect of the ground mineral by simply mixing it with certain other fertilizers. Ferd. Schack of Cologne has taken out a patent for the following process:

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(1) According to REMY: *Ill. landw. Ztg.*, 1910, No 677.

(2) " " KRÜGER: *Mitt. der Vessuchsstation Bernburg*, No. 48, 1911.

(3) " " POPP: *Oldenburg Landwirtschaftsheft*, 1912.

(4) " " GERLACH: *Landw. Centrallblatt für die Provinz Posen*, 1913, No. 3. Here perhaps no wholesale price was taken as the basis of the price of phonolite.

Process for the preparation of manures composed of recent eruptive minerals containing potash and combinations of lime. The quantity of lime as such, or in combination as cyanamide, nitrate of lime, carbonate of lime, gypsum, to be mixed with the finely ground, unroasted mineral in sufficient quantity to provide the molecular equivalent of the bases contained in the mineral.

By means of the exchange of bases the potash contained in the eruptive mineral is calculated to form combinations assimilable by plants.

PFEIFFER, BLANCK and FLÜGEL (1) have examined the above process by means of careful experiments, and have ascertained that the effect of the potash in phonolite is in no wise improved by it.

The experiments of Prianishnikov have shown that the not easily soluble potash of feldspar is not rendered more assimilable by mixing with physiologically acid fertilizers such as sulphate of ammonia, which on the contrary increase the solubility of the hardly soluble phosphoric acid of crude phosphates. This agrees with the fact that neither phonolite nor feldspar has a better effect on acid moor soils than on other land.

CHEMICAL TREATMENT OF SILICATES OF POTASH.

In several countries many attempts have been made to render the potash contained in several minerals, and especially feldspar, more soluble by industrial processes. With this object in view several patents have been taken out in America for processes which consist essentially in roasting the crude potash mineral with lime, or its carbonate or chloride, or common salt. This process is, however, too expensive and it is now sought to obtain potash as a by-product in the manufacture of cement. The question has been fully reported in this *Bulletin* (2).

Similarly in Sweden, as well as in Germany, the treatment of feldspar has been tried. Sulphuric acid and electricity have been applied but hitherto without any decisive result (3).

In conclusion we may subscribe to the opinion of the Swedish agricultural chemist F. VON FEILITZEN, who says: "Even if the above attempts represent an increase of our knowledge on the hardly accessible source of potash in feldspar as a means of emancipating our agriculture from foreign potash fertilizers, we are still a long way from the solution of this important problem; until we reach it we can be satisfied that in the German potash salts we possess an excellent, quick-acting and not too expensive manure".

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(1) *loc. cit.*

(2) See No. 1613, *B*. Dec. 1912.

(3) In America great hopes were founded on the treatment of seaweed, from which in reality great quantities of potash can be extracted. Nevertheless a factory recently erected in California for this industry has already given up treating seaweed as unprofitable.

The Present State of Olive Growing in Italy

by

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From the most remote antiquity the cultivation of the olive has been very important in Italy.

The special conformation of the country, its position in the basin of the Mediterranean, that is in the centre of the habitat of the olive, the mildness of its climate and the fertility of its soil, render the peninsula very favourable to the growth and productioness of this oil plant. It is not certain whether Italy or Spain occupies the first place for extent of area under olives and for quantity of oil produced. Whilst the sources of Spanish statistics are liable to discussion, in Italy at present a different system is followed in the valuation of the area under olives, a distinction being made between the area devoted exclusively to olive trees and that which these trees share with other crops. Thus comparison between the two countries is not possible at least as regards the areas.

The statistics made before the introduction of the new system give the following figures for the acreage under olives:

	acres
Average between 1870 and 1874	2 210 650
» » 1879 » 1883	2 294 630
» » 1890 » 1895	2 663 538
» » 1901 » 1908	2 705 428

With the new system the figures are:

Average between 1909 and 1912	acres
Olive trees intermigled with other crops	4 358 562
Olive trees alone	2 353 560

Considering the figures according to the new sytstem to be correct, it appears that the area estimated at 2 705 428 acres was in reality 3 423 420 acres.

Though we may not infer that the area occupied by the olive has risen from 2 210 650 acres in 1870 to the present 3 423 420 acres, as the latter figure may be, and probably is, due to greater accuracy or at any rate to a different method of estimating the area, there are in reality grounds for believing that the area under olive trees has sensibly gained in extent, as a fair number of new plantations are to be seen, mostly better set out than the older ones. There was, however, a short period after 1880 during which many olive groves were destroyed to make way for vineyards; this took place especially in Sicily and Calabria.

As for the yield, statistics point to a constant decrease from 1870 to the present time.

Taking into consideration large averages we get, up to 1908, that is up to the new statistics, the following figures for olive oil:

	gallons
Period between 1870 and 1883	73 843 000
» » 1885 » 1896	53 663 500
» » 1897 » 1908	45 988 800

According to recent statistics the average from 1909 to 1912 was 40 282 000 gals.; but perhaps 50 025 800 gals. would be nearer the mark, as it would include the residual oil (including "olio lavato", extracted from the pomace by washing; "olio d'inferno", collected from the well under the presses; and that obtained by treatment with carbon disulphide). (1). For comparison, with the returns of the older statistics the figure of 43 956 000 gals. should be taken, as it includes only the "inferno" oil. It confirms the decreased yield of the olive tree.

The causes of the decrease of production and of the critical state of this crop during the last thirty years are many and of various kinds, namely: weather conditions, parasites, and constitutional and cultural conditions.

Reviewing notes on the oil crop since 1889; it appears that during these 25 years *drought* and *scirocco* caused more or less injury in 21 cases; *winter frosts* and *cold springs*, and *mists* and *rain* that injured the flowering, in 7 cases; the *olive fly* caused serious and general injury in 10 cases; lesser or partial damage, together with *Rhynchites* and *Phlaeothrips* and other insects in 7 cases; *Cycloconium* caused partial injury from the year 1902 onwards and since 1910 with increasing gravity and in almost all the growing districts. From the above it is seen that the most efficient cause of injury is the almost constant *drought*, which is easy to understand if one remembers that the olive tree grows mostly on hills and mountain slopes and most frequently without the necessary work being done to retain the rainwater, while the olive tree requires a good deal of moisture, which, as Giglioli (1) says, is the manure *par excellence* of the olive tree, especially during the growth of its fruit. Next in order of importance come the serious attacks of the *olive fly* and other animal or plant parasites, the development and spread of which are to a great extent dependent upon the abnormal physiological and cultural condition of the trees which we shall briefly consider.

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(1) Whilst in the old statistics the quantity of oil was ascertained directly from that obtained during the season in each commune, with the new system the quantity of olives is recorded and the quantity of oil is calculated according to the average yield in the mill in the various districts. This yield does not include the "inferno" oil, nor that obtained by washing or treating with carbon disulphide, though these oils also are put upon the market; the first of these oils is used to a great extent as food by the poor, who often prefer it to the better oils; it is also used, as well as that obtained by washing and by treatment with disulphide, in the industries. The "inferno" oil may be calculated at about 1.5 per cent. and the other two oils at 2.5 per cent. of the crushed olives.

In the first place let us examine how the olive is cultivated in the various regions of Italy (2) (see Table 1).

TABLE I.

Region	Intermingled culture acres	Specialized Culture acres	Total — acres
Piedmont	—	—	—
Liguria	62 738	88 426	151 164
Lombardy	9 139	3 705	12 844
Venetia	2 717	4 693	7 410
Emilia	16 549	—	16 549
Tuscany	685 919	26 182	712 101
Marches	425 581	—	425 581
Umbria	141 778	17 043	158 821
Latium	126 711	40 508	167 219
Abruzzi and Molise	657 514	4 940	662 454
Campania	446 082	106 210	552 292
Apulia	545 376	712 101	1 257 477
Basilicata	42 484	40 014	82 498
Calabria	491 530	141 284	632 814
Sicily	696 787	117 078	813 865
Sardinia	7 657	51 376	59 033
Total	4 358 562	1 353 560	5 712 122

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(1) SOCIETÀ DEGLI AGRICOLTORI ITALIANI: Di alcune condizioni che influiscono sull'efficacia dei concimi chimici. Rome, 1903.

(2) MINISTERO DI AGRICOLTURA, INDUSTRIA E COMMERCIO. — UFFICIO STATISTICA AGRARIA. Prospetti riassuntivi dei XX prodotti rilevati nel quadriennio 1909-1912. Part 12, June 1913.

As the above table shows the olive tree is grown in all the regions of Italy save in Piedmont, but two thirds of the olive groves are in the south of the peninsula, the provinces of Apulia, Sicily and Calabria occupying in this respect the foremost positions.

Fully three-quarters of the olive groves are under intermingled crops, that is they contain besides olive trees other plants, most frequently cereals (wheat and maize) which are grown up to the very trunks of the trees; most of the groves consist of old irregularly arranged trees, often in rows running straight down hill on very steep soils, or without sufficient protection against the surface water which lays their roots bare. In those groves mostly (the older ones) formed exclusively of olive trees, they are often too close together so that the crowns in their struggle for light and air grow to a great height; as much as 33 to 48 feet; this may be seen in Calabria, in Liguria and in some parts of Tuscany.

The number of different varieties scattered at random in the groves is considerable; there is also much confusion in their names; nevertheless the number of the prevailing varieties grown for oil in each region is relatively limited. The following may be noted as being the most frequently met with and the richest in oil:

In Liguria: *Taggiasco.*

In Tuscany: *Razzo* or *Frantoiano, Moraiolo* or *Morinello,* and *Leccino.*

In Umbria and the Marches: *Raio* or *Razzo, Moraiolo,* and *Carbonella.*

In Latium: *Carbognola* or *Marsella,* and *Verniera.*

In the Abruzzi: *Nordana, Gentile* and *Olivone.*

In Apulia: *Paesana* or *Baresana, Coratina, Monopolese,* and *Ogliarola.*

In Calabria: *Ottobrarica, Coccitanica, Mammolese, Nicastrese, Cumignana,* and *Roggianese.*

In Terra di Lavoro and Molise: *Aurina* and *Caiazzana.*

In Lombardy and Venetia: *Casaliva* or *Nostrana,* and *Drop* or *Tombolet,*

In Sicily: *Ogliaia, Calamignara,* and *Cerasola.*

In Sardinia: *Maiorchina* and *Genovese.*

In general, among the above-mentioned varieties that give the most valued fruit, there are others called *Olivastri, Olivastroni* or *Olivastrelli,* because they are hardier, more resistant and more constant in bearing fruit than the preceding varieties, but their fruit does not contain so much oil nor is it as delicate. These latter varieties deserve greater consideration in view of the exhaustion and low productiveness of the other varieties due to their having been multiplied a vegetatively during centuries and to their lack of resistance to unfavourable conditions.

In fact for centuries the olive trees have been multiplied by means of *ovoli* or *puppole,* as the egg-shaped buds which are formed at the base of the stem are called in Tuscany, Umbria, Latium and Reggio Calabria, in which regions this method of multiplication is used. In the Marches, Apulia, Abruzzi, Catanzaro, Cosenza and Sicily cuttings (*talee*) are used, and in Liguria, Lombardy, Venetia, Latium and some parts of Sicily the shoots that grow at the foot of the tree (polloni) are preferred. Less frequent is the use of wild olive trees, as in the districts of Lecce, Capitanata

Grosseto and Sardinia, and still more rarely recourse is had to plants obtained by sowing the olive stones. The result of the above vegetative methods has been to perpetuate the defects of the mother plants, such as canker, and low resistance to frosts, drought and parasites. To the harm caused by these original defects, the injury caused by neglect or unsuitable pruning, manuring, tillage of the soil and control of parasites is frequently added.

As for pruning, while the necessity of practising it at short intervals, possibly every year or at least every two is being gradually recognized, still the custom of pruning every three or four years is still very prevalent; there are some important oil-producing districts, especially in the south, where as many as seven or eight and even ten years elapse between one pruning and the next (1).

In Italy there are some centres in which capable pruners are found and they are much esteemed and sought for abroad (Dalmatia, Istria, Greece). There are also schools which prepare pruners by means of practical courses. A wider diffusion of the sound principles of olive pruning would be very desirable, because in several regions nothing could be more capricious, superstitions and ignorant than the way in which this, the most delicate of cultural operations and intimately connected not only with the productiveness of the tree but with its vegetation and resistance to disease, is carried out. Some think that they must cut blindly, topping and even pollarding the tree; others treat the olive like the mulberry; others, again, scarcely touch the tree, notwithstanding the length of time that is allowed between the successive prunings, for fear of removing too much foliage (parts of Calabria, of Sicily, of Tuscany, of Liguria). Some lop off a main branch every other year leaving the rest untouched, with the idea of thus rejuvenating the tree (!) while in reality they favour the spread of canker (Umbria). Other pruners train the main branches nearly horizontally, hollow out the crown and cause the tree to produce a number of low hanging branches reaching almost to the ground (Bari, Potenza and Florence districts, part of Umbria, etc.), while others keep the whole framework of the tree almost vertical and remove all the lower branches or allow the tree to grow naturally, in neither case considering the special conditions of the tree nor the requirements of the variety, etc.

As for manures there are districts where little or no manuring is done, some in which manures are given once every three or four years, and others in which the olive tree is frequently and well manured. In general farmyard manures (from horse stables and cattle and sheep sheds) are given; sometimes pure sheep or goat dung or night soil is used. The animals are often run in the olive groves for the sake of their droppings; less frequently woollen rags, leather waste, hoof and horn shavings, fish residues, silkworm chrysalides, olive pomace and the like are applied as manure. Mineral substances, such as builders' waste, ashes and to a limited extent chemical manures, or vegetable matter, either previously rotted or not, such as seaweeds, swamp grasses, leaves of forest trees, weeds, pine needles, etc., are given. Lastly leguminous green manures (lupins, beans, vetches, etc.) (1) are used, but only to a very limited extent. Usually the olive trees grown together with other crops get the best treatment as they profit by the manure given to the latter.

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(1) SOCIETÀ DEGLI AGRICOLTORI ITALIANI: *L'olivo e l'olio in Italia,* Monograph presented at the International Exhibition in Paris, 1900.

IDEM: *Inchiesta eseguita sulla propagazione e concimazione dell'olivo,* 1912.

As for tillage, in general little is done: the ground is hoed or ploughed with a primitive implement at long intervals, generally once a year, or twice at the utmost, and this while drought is one of the weather conditions that has the most depressing effects upon the yield.

As for the diseases that attack olive trees there are a number of them: canker, bacterial tumours, root-rot, olive fly, weevils, scale insects, *Psylla oleae, Rhynchites, Phlaeothrips,* fumago, *Cycloconium. Stictis Panizzei,* are the chief diseases which have always with more or less virulence attacked the olive tree already apparently suffering from senility. There is no doubt that at present the most injurious pests are *Phlaeothips* and *Cycloconium* the latter especially, both of them destroying the foliage of great extents of olive groves. *Cycloconium* is all the more dangerous inasumch as through the ignorance of the great mass of olive growers its action is especially insidious. The farmer notices an unusual fall of the leaf, usually, in spring, and gets alarmed. But soon, new leaves appear, the olive tree is again green and the farmer is reassured, especially when he sees a certain amount of bloom showing, which is the case if the disease is not far advanced. But meamwhile the flowers and the young fruit fall, the oil crop is nil, and by the end of the succeding winter or in spring the leaves fall again and more plentifully. The olive grower gets discouraged and abandons the olive trees to themselves, depriving them even of the scanty care until then bestowed upon them. This happens now in a great part of Italy and it is urgent to have recourse to the more or less perfect remedies that are known: that is to spraying with salts of copper in order to prevent the germination of the conidia of the fungus, and to the intensive culture of the olive tree as indirect means of increasing its vigour and resistance to disease.

Fortunately for Italy, by the side of the old unproductive and perishing olive groves there are others either recently planted or restored to vigour which are carefully tended, pruned, manured and systematically protected against diseases; these show clearly that no fear need be entertained as to the extinction of olive cultivation, but on the contrary demonstrate its great utility, especially on hill slopes where no other culture would be possible or advantageous. And if the results of experiments recently conducted in various parts of Italy on the improvement, management and manuring of olive groves become widely known and lead to the following measures being adopted, there is no doubt the olive in Italy will soon resume its place among the most paying crops.

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(1) See pamphlets already quoted: CONSOCIAZIONE DEI COMIZI AGRARI ITALIANI, *Sulla concimazione chimica e con sovesci delle viti e degli ulivi. Risultati d'inchiesta in Italia.* — Prof. CIRO CUAGLIOTTI, relatore. Terni, 1912.

The most important measures for the improvement of the olive groves are: thinning out of those that are too crowded, thus freely admitting the sun, a great enemy of most parasites; gradually and systematically pruning the trees so as to oblige those that have grown too tall to throw out new branches nearer to the ground; replacing the old decaying trees by seedlings that have been grafted to the varieties most suitable to the various localities and which can now be easily prepared in every farm or can be bought from the best nurserymen of Tuscany (Pescia, Pistoia, Florence) and other parts of the country; a suitable arrangement of the steep slopes and using the hoe or the plough together with green manuring so as to keep the necessary moisture in the soil during the summer; returning to the soil the necessary fertilizers, particularly those containing phosphoric acid and potash (and lime in some cases), and lastly spraying with mixtures containing copper against *Cycloconium*, which operation is rendered easier by the thinning out and lowering of the crowns of the trees, and using eventually other treatments to control other pests.

The Recent Development of Cattle Breeding in Sweden.

by

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I. — Increase in the Numbers of Live Stock.

The northern position of Sweden makes it naturally more suitable for the rearing of live stock, particularly cattle, than for grain growing; this feature is all the more pronounced in the north, and Norrland produces only a very small proportion of the grain required by its inhabitants.

The live stock of the country consists of horses, cattle, sheep, goats, pigs, poultry and reindeer, the latter belonging to the nomad Lapps in the high north. The numbers at the end of 1911 were as follows:

Horses under three years	493 322	
Horses over three years	95 165	
		588 487
Cattle		
Steers	144 277	
Bulls	52 467	
Cows	1 837 035	
Young stock	655 830	
		2 689 609
Sheep		945 709
Goats		66 136
Pigs		951 164
Poultry		3 961 141
Reindeers		276 084

If the various classes of stock (horses, cattle, sheep, goats and pigs) are calculated as cattle units (1), we get the figures shown in Table I as indicating the increase in the numbers of live stock in Sweden in the last half century.

TABLE I.

Year	Cattle Units	Per 1000 inhabitants	Per 1000 acres of area	
			total	of arable and permanent grass
1865	2 591 037	630	26	245
1875	2 863 006	653	28	247
1885	3 093 955	661	30	252
1895	3 367 999	685	33	272
1905	3 406 961	643	33	265
1911	3 617 472	655	35	291

Thus the live stock population has steadily increased; but since 1895 the increase of the human population has been more rapid than it. The fact that the number of cattle units per area of land has steadily increased through this period would lead one to expect a similar increase in the area under green crops, and the agricultural statistics show that this is the case. This increase has been especially in root crops for feeding, but the yield of hay on the temporary grassland has also increased considerably.

Sugar beet growing hardly existed 25 years ago; by 1890 the yield was 220 700 tons and in 1911 it had risen to 950 300 tons. The crop of roots for feeding (mangels, carrots, turnips and swedes) increased from 3 235 000 bushels in 1865 to 98 351 000 bu. in 1911. In 1890 the crop of hay from temporary leys was $2\,^3/_4$ million tons, but lately it has exceeded 4 ¼ million. Green crops have also extended considerably, especially in the north, but there are no statistics for them. Further, the increase in grain crops has meant more straw available for feeding.

By means of this increase of fodder resources it has been possible to bring up the stock of animals; the development has been greatest with cattle and pigs, both in quantity and quality. The numbers of the horned stock of different types are shown in Table II.

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(1) One cattle unit = 2/3 horse, 1 beast, 8 sheep, 12 goats or 4 pigs, two young animals of any class are equal to one adult of the same class.

TABLE II.

Year	Steers	Bulls	Cows	Young stock	Total
1865	282 844	38 791	1 185 556	417 163	1 924 354
1870	269 762	38 674	1 231 477	426 014	1 965 927
1880	289 071	47 985	1 409 236	481 465	2 227 757
1890	253 735	49 066	1 578 927	517 763	2 399 491
1900	218 932	51 390	1 764 819	547 414	2 582 555
1905	184 328	49 444	1 763 857	552 299	2 549 928
1910	152 925	54 703	1 861 219	678 679	2 747 526
1911	144 277	52 467	1 837 035	655 830	2 689 609

Only the steers have shown a permanent falling off in numbers; as they are kept in Sweden only for work, this is due to the increase in the wages of labour, which has made horses more economical owing to their quicker going. The fact that the number of bulls has not increased as rapidly as that of cows, or has even decreased in some years, is probably the result of the extension of cooperative bull societies, which has meant considerable economy in the number required. Except for a slight relapse in 1911, caused by shortage of crops, the cows and young stock have shown a large and steady rise in numbers, reaching over 55 per cent. in the period.

For a just appreciation of the enhanced value of the horned stock, more attention must, however, be given to the improvement in quality, which has greatly exceeded the numerical increase.

II. — IMPROVEMENT OF THE BREEDS.

When towards 1840, general interest began to be aroused in Sweden in the improvement of the cattle, the prevalent opinion was that the indigenous breeds were so inferior that the only way to improve them was by crossing with well-known breeds from other countries. A number of herds of various breeds were imported to find which would be the best for the purpose. The only two breeds which gained the confidece of farmers were the East Friesian (from Holland and Ostfriesland), and the Ayrshire; these breeds have become so widespread and have been so largely used for crossing that the indigenous breeds have almost entirely disappeared in the southern and central parts of the country, the introduced breeds have taken their place either pure or as crossbreds. A reaction against this excessive importation began towards the end of the century. The two introduced breeds had developed so well that it no longer seemed necessary to depend on continued importation, which was always uncertain for the breeder; little by little importation has become less important, and rational selection of the breeding stock has led to such a development of national breeding that Swedish East Friesians and Ayrshires can compete with the animals in their original homes; recently stock of both breeds has been exported at very good prices.

Besides this, some more or less wholly indigenous races have been developed. In Central Sweden there were a number of gentlemen's herds descended from the native red or yellow cattle, but containing a good deal of Dutch, Shorthorn and Ayrshire blood; they combined a good milk yield with considerable weight and early maturity. The owners of these herds combined to form a uniform breed without using imported animals, and their efforts have been so successful that the race thus evolved, the Red Spotted Swedish, has now been recognized as a pure breed. They are most like Ayrshires, but make better butcher's beasts than these.

While the above-mentioned breeds have done well in the more fertile parts of central and southern Sweden, the same cannot be said of the north of the country, where feeding is much more scanty and the beasts have to find their food in the forest in summer. In these parts, the indigenous polled cattle, white or spotted on a white ground, was retained; this breed, known as the Fjäll, gave little in the way of milk or meat, but was accustomed to unfavourable natural conditions. It was generally believed that the low production was a direct result of the conditions of life, and that nothing better was to be expected. All the same, a beginning was made some thirty years ago at attempts to improve the breed by better feeding and selection of the best milking strains. The result of these efforts is that there are now a number of small herds which give an average yield of 6000 lbs. and more of milk a year, a very satisfactory amount in consideration of their live weight; this, though increased a good deal, hardly exceeds 750 lbs. for cows.

The uncertainty as to choice of breeds has now ended, and each district has fixed on one or more of the four breeds mentioned: 1) East Friesian, in the most fertile districts; 2) and 3) Ayrshire and Red Spotted Swedish, where the conditions are not quite so favourable; and 4) Fjäll, where the poor alpine and forest pastures have to be used.

Besides the Fjäll there was another polled breed, red in colour, of which only a few remnants remained scattered in out-of-the-way districts in various parts of the country. In the last few years these have to some extent been collected together to make a pure breed, the Swedish Red Polled cattle, and the results already obtained with some herds look encouraging.

III. — MILK YIELD.

The progress realized in the productivity of the cattle can also be seen from the figures for production of milk and butter and for increase of live-weight. The official statistics do not give direct information on these points, but our statisticians have attempted to estimate the figures for milk production. Thus M. Gustav Sundbörg works out the average milk yield per annum as follows:

About	1870	2 600	lbs.	per cow
»	1880	3 100	»	»
»	1890	3 700	»	»
»	1903	4 200	»	»

Another author, M. Nils Hansson, an authority on the dairy-farming of the country, has estimated the present milk yield at an average of 4730 lbs. The three first figures of M. Sundbörg's table are very uncertain, as they come from a pure estimation of the production of the different provinces, in which the breeds, feeding and management are very variable. The figure for 1903 is already an improvement, as it is the result of estimations of the mean annual production made in every parish throughout the country; the 1912 figure is still more trustworthy, as it is based on the latest reports from the Dairy Control Societies.

Under these societies, numbering 749 in 1911-12, no less than 215 742 cows, or nearly 11 per cent. of the total number in the country, were submitted to careful control; the results are as follows.

The mean annual yield per cow was 5748 lbs. of milk, with an average fat content of 3.50 per cent., corresponding to 201 lbs. of butter-fat or 238 lbs. of butter. As the control herds are among those in which systematic efforts for improvement are made, M. Hansson has deducted 20 per cent. from this yield to get the average for the whole country, giving the figure quoted above.

The great variation of yield in different parts of the country can be shown by parallel figures from the two provinces giving respectively the highest and lowest yield (Table III).

TABLE III.

Province	Average yield		Number of cows under control	
	milk lbs.	butter lbs	total	percentage of total stock
Malmöhus: average	8 087	289,6	46 084	32.6
highest society	10 392	364,8	324	—
lowest society	6 200	239.3	64	—
Vesterbotten: average. . . .	4 388	154,3	2 569	3.9

On the basis of these figures, the total milk prodution has been calculated as follows:

1875	about	3100	million	lbs
1885	»	4100	»	»
1895	»	5400	»	»
1905	»	6600	»	»
1910	»	13200	»	»

The progress in milk production led to a corresponding development of the dairy industry. Formerly the treatment of milk was a household affair, and it was not till 1865 that the first dairies were started. The earliest ones were established by the owners of large estates to use the milk from their herds; these may be called "*estate dairies*"; but gradually *commercial dairies* came to be started by private persons or companies. They were not connected with any form of farming and treated purchased milk. The great profits which the proprietors of these dairies often made and the difficulties which arose from the lack of interest of the farmers in the quality of the milk sold to the dairy, combined to produce general discontent with this type of dairy; towards 1890 *cooperative dairies* were started; in these the farmers shared according to the amount of milk supplied and the fat content was soon also taken into consideration.

This type of organisation has proved very advantageous, both as regards better quality of the milk and the products turned out, and in giving better financial results. The consequence is that the cooperative dairies have gained on the estate and commercial ones, as shown by the figures in Table IV.

TABLE IV.

	1890	1900	1905	1910
Total number of dairies	1 562	1 793	1 575	1 461
Estate	809	624	399	
Commercial	610	529	536	
Cooperative	73	302	470	
Milk treated . . . . . lbs.	1 115 784 000	1 856 909 000	2 024 050 000	2 533 590 000
Butter produced . . . »	35 480 000	58 657 000	62 791 000	73 985 000

The diminution in the number of dairies in the last few years is due to a concentration of the industry, consisting in the disappearance of many small competing establishments in favour of larger and better organized ones.

The chief object of the Swedish dairy industry has always been the production of butter; a part of this, increasing up to 1896 has been exported particularly to England, to which country it goes direct or via Denmark.

The total exports for the last fifty years have been in round numbers:

1861-65	355 800 lbs.	1886-90	31 074 000 lbs.
1866-70	248 900 »	1891-95	44 147 000 »
1871-75	6 954 700 »	1896-1900	48 074 000 »
1876-80	9 248 000 »	1901-05	42 718 000 »
1881-85	17 678 000 »	1906-10	40 857 000 »
1912	45 717 000 lbs.		

VI. — BUTCHER'S BEASTS

Before the beginning of the dairy industry and the exportation of butter, attempts had been made to export live cattle to England. The success of this enterprise was not great, owing to the poor quality of the Swedish cattle; but as the increasing interest in milk production gradually led to better feeding and consequent greater body development, the exportation of butcher's beasts became more important, till it was put an end to in 1892 by the prohibition of introduction of live cattle into the British Isles. Efforts to turn the exportation to Germany were also soon frustrated by similar measures in that country, but since the beginning of the new century exportation of live cattle and meat has developed again; it is directed chiefly to Germany and Switzerland.

TABLE V.

Annual exportation of cattle and meat from Sweden.

Year	Bulls	Steers	Cows	Young stock	Value £.
1881-85	1 207	30 660			317 400
1886-90	2 489	13 135	15 265	1 981	368 600
1891-95	3 935	5 481	9 300	955	203 650
1896-1900	2 292	1 253	5 265	1 010	103 550
1901-05	3 577	404	7 038	3 558	118 900
1906-10	3 365	563	8 284	4 971	190 950
1911	6 974	6 946	19 711	13 340	566 200

The importation of live cattle and meat into the northern industrial districts, chiefly from Finland, has never been of much importance. In 1911 the value was £. 34 600.

Naturally the better feeding has increased the live weight of the cattle. Statistics do not give any direct evidence on this point, but it can readily be demonstrated from material taken from the reports of the breeding societies. Thus, the normal weight of Ayrshire cows, which are the most widespread in the central and southern provinces, was estimated at 1000 to 1050 lbs. about 1890; at present it averages 1100 lbs. The weight of Friesian cows, which are kept chiefly in the fertile province of Malmöhus, has also improved, and is now reckoned at 1300 lbs. The Red Spotted Swedish, developed chiefly by crossing with Ayrshires, occupies an intermediate position between these two breeds as regards live weight of the cows. The same progress can also be observed in the two native polled breeds — the Fjäll (white and spotted), predominating in the north, and the Swedish Red Poll, which is the most southerly branch of the hornless cattle. For the Fjäll breed, the normal weight of the cows was estimated at 660 to 700 lbs. in 1890, and it now reaches 770 to 810 lbs.; the live weight of the Red Polls may reach even 840 or 880 lbs.

V. — ORGANIZATION.

The development in the stock of cattle to which we have drawn attention is naturally the result of the efforts and care of the farmers themselves, but it has been greatly encouraged and facilitated by various measures taken by the authorities carried out at the public expense. In the first place should be mentioned the regular shows, with prizes distributed on a uniform system ("Flach System"); these were begun in the province of Skaraborg in 1882, and in 1892 were organized in all the provinces with the help of grants from the Government and the Agricultural Societies; each province forms a prize district. The idea of these shows is to bring to light all animals fit to be used for breeding and to classify them by prizes according to their value for the purpose. For each approved cow, the owner receives a service ticket for each year, giving the right to put the cow to a prize bull of the same breed; the owner of the bull is then paid for the tickets at a rate depending on the class in which the bull was placed.

These shows are specially intended to improve the stock of small farmers, and they alone are entitled to prizes and service tickets for cows. But, owing to the sums brought in by the service tickets to the owners of specially good bulls, the Flach system also encourages high-class breeding among the wealthiest farmers.

These shows, which are generally held every other year in a locality, have been very valuable in bringing farmers to recognize the importance of breeding from good stock. Another result has been that in each district one or two breeds have been fixed upon as specially appropriate for the natural and economic conditions of that district.

The shows have continued to increase in number, and at the same time the proportion of the cows approved has become higher. In 1910, 62 670 animals were examined, and 55917, or 89 per cent., were approved or given prizes. The expenses for the year reached about £18 000.

As we have just shown, the giving of prizes and the money brought in by service tickets may make the keeping of bulls a profitable business; to this circumstance is due the formation of coperative bull-keeping societies. The provincial agricultural societies encourage these societies by loans without interest for the purchase of bulls and by special prizes at the shows. The formation of these societies has developed at about the same rate as the shows, and there are at present about 1200 of them, distributed throughout all the provinces of the country.

Another measure in connection with the shows has been the establishment of herdbooks for the more important breeds. These have generally been drawn up and published by the provincial agricultural societies soon after the starting of shows on the system described. Registers for certain breeds have also been established by the societies for the improvement of these breeds (Ayrshire and Red Spotted Swedish). Lastly, the Government has undertaken the preparation of herdbooks for one or two breeds; of these, the Ayrshire is the only one yet published, but the Fjäll will appear shortly.

Next to the shows, the Control Societies have contributed most largely to the great progress in live-stock breeding and the improvement of the economic position of stock farmers. The first society of this nature was founded in 1898, and at the and of 1912 the total number was 749, distributed through all the 24 provinces of the kingdom. The largest number, 160, is in the province of Scania, which is the most populous and best cultivated part of the country; but these centres of advancement in the economy of live stock occur right up to the desolate regions of Lapland.

The effects of the regular control organized by these societies have everywhere been seen in the disappearance of the cows that gave the smallest return for the food consumed and in a more severe selection of the animals to breed from; the consequence is that the average milk yield has shown a more or less rapid rise. In the earlier years this rise was largely due to better feeding; the amount of food per cow, as well as in relation to the milk yield, often rose for a time; but the farmers soon learnt to make up more suitable rations, and the number of fodder units diminished in proportion to the milk produced, and often also absolutely.

By publishing the results obtained yearly for each herd, the control societies very soon made known the productive capacity of the herds as well as of the individuals composing them. From the beginning of the present century, the control figures for the production of milk and butter-fat have been used along with the external points and pedigrees for judging the animals at the great national shows held every five years (last in 1911). But these control figures are not deemed sufficient for judging the breeding value, especially in highly selected strains.

To meet the need for more searching examination of the animals for this purpose, which is particularly required in the distribution of the great State prizes for breeding stock, competitions of breeding centres have been established. The herds entered for these competitions are submitted to careful control for two years ; the observations extend to quantity of milk and butter-fat produced and consumption of food for each cow, and uniformity, health and vigour for the herd in general. Such competitions have been arranged twice, in 1903 and 1908, and a third will begin this year. The distinction of being classed as a breeding centre has been found to be of such considerable commercial advantage that at present money prizes are no longer distributed except for herds of the Fjäll breed, which as a rule belong to small farmers.

The direction of the official measures just described is entrusted to committees appointed by the Government and the Provincial Agricultural Societies; but besides these, the breeders have formed societies for the different breeds ; The first of these was the Red Spotted Swedish Society, formed in 1891; in 1899 the Swedish Ayrshire Society was founded for the development and consolidation of the various strains of Ayrshires occurring here and there over a large area, and of very varying types. These two societies organized the registering of animals descended from those entered in the Ayrshire Cattle Herd Book and given a certain annual yield of butter-fat. For the Red Spotteds, cows must give 220 lbs. of fat, and bulls must be out of dams giving 265 lbs. The minimum for Ayrshire cows is 242 lbs. during each of two successive years.

To facilate the purchase of good breeding stock, each of these societies organizes two auction sales a year; at these, registered bulls, free from tuberculosis and approved at an inspection immediately preceding the sale, are offered to the public.

During the present year, two new societies have been founded to work on the same lines as those already mentioned, one for the Friesian breed and the other for the Swedish Red Polls.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

1126 – **National School of Waters and Forests at Nancy** (**France**). — GUINIER PH. in *La Vie agricole et rurale*, Year II, No. 35, pp. 224-230. Paris, August 2, 1913.

A State School of Forestry was founded in France in 1824, and two years later was established at Nancy where its headquarters have remained ever since. These consist both of educational buildings and of residential quarters for the State scholars and for the staff; special mention should be made of the museums, where extensive forestry collections of different kinds have been accumulated. There are further 7625 acres of forest under the direct management of the School; the greater part of this is in the neighbourhood of Nancy (Forests of Haye and of Amance) and the rest in the Vosges Mountains about 40 miles distant (Forests of Elieux and of Ban d'Etival). These four forests provide examples of various types of soil and of forest management, and together with a nursery on the outskirts of the Haye Forest, where there is also a piscicultural experimental station, and an arboretum at Amance, complete the equipment of the School.

The students may be divided into two classes: the so-called "regular" students or State scholars and the "free" students. The former are men who have already taken their diploma at the State Agricultural College ("Institut National Agronomique") and have further been submitted to a competitive entrance examination in mathematies and modern languages. Occasionally a graduate of the Polytchnic School ("Ecole Polytechnique") is admitted directly and without competition. The total number of these State scholars varies from 12 to 35 according to the needs of the Forest Service, and at present they number 18. When entering the School they sign a contract for four years, the first and last of which are spent doing military service, while the two intermediate yeas are spent at Nancy. During the latter period, the scholastic year is divided into two terms: the winter term from October to April, when the work consists chiefly of lectures and laboratory work, and the summer term April to August, when the work is wholly of a practical nature and takes place in the School forests. Further, during the two years, two months are spent visiting forests in other parts of France, and throughout the whole course a certain amount of military instruction is given and a fairly strict discipline is maintained. After leaving Nancy the State students complete their military service by serving for a year as sub-lieutenants in an infantry regiment and then pass into the State Forest Service.

The second class of students consists chiefly of foreigners, who are admitted to the School and allowed to follow the course of instruction wholly or in part. The latter embraces forestry and its applied sciences, forest surveying and forest law.

The teaching staff consists of seven members of the Forest Service, a military instructor, and a lecturer in Letters and modern languages, while the management of the School forests is in the hands of two special forest officers who were originally appointed to take charge of the experimental work.

1127 - **Travelling Schools for Rural Domestic Economy (France).** — DUCLOUX, A. in *La Vie agricole et rurale*, Vol. 2, No. 38, pp. 305-308. Paris, August 23, 1913.

Though the first travelling school for Rural Domestic Economy in France was only founded in December 1905, at the present day 30 such schools exist, 2 others are to be opened shortly, and the formation of yet 6 others is under discussion. Many of them give short summer courses in training colleges of their districts. On the whole it may be said that the instruction is being appreciated by farmers and their families, and that the movement is proving a success.

AGRICULTURAL INSTITUTIONS

1128 - **The Agricultural Institutions of Spain.** — DE LA ROSA, GUMERSINDO FERNANDEZ. Apuntes históricos sobre los progresos de la agricultura española en los cinquenta años ultimos. — *Boletin de agricultura técnica y economica*, Year V, Nos. 49-54, pp. 63-72, 167-176, 236-244, 335-345, 449-460, 521-532. Madrid, January-June, 1913.

This article gives a historical summary (accompanied by general remarks on rural and political economy) of the more important facts concerning the progress of agriculture in Spain, especially in the south-west district, during the course of the last fifty years. The writer brings into prominence the measures taken by the Government for the encouragement of agriculture and agricultural instruction.

A Royal Decree of 1855 founded the " Escuela general de Agricultura ". Two of the first agricultural engineers who studied there founded, in 1862, the " Sociedad El Fomento Agricola " at Jerez de la Frontera; to this society is due the introduction into Spain of the first mowing and threshing machines. These innovations, and the introduction of *Hedysarum coronarium* L. (" sulla "), which necessitated horse-rakes and hay-makers, into the southern coast district of the Peninsula, gave a great impetus to agriculture and to stock-breeding industries in that district.

From 1875 to 1879, the extension of the " Instituto Agricola de Alfonso XII " was provided for by a series of legislative enactments. This Institute was the former "Escuela general de Agricultura". The law of August 1, 1876, dealing with agricultural instruction, created chairs of agriculture in all the colleges ("Institutos") of the Kingdom. The "Asociación de agricultores de España" dates from about the same time, and has the merit of having organised shows, competitions and congresses. The "Exposición Nacional Vinicola" of 1877 was on a magnificent scale. Unfortunately, phylloxera made its appearance shortly afterwards in Spain, and destroyed over 7 million acres of vineyards. The spread of the pests was arrested by reconstituting the vineyards with vines on Amerian stocks.

The Royal Decree of February 14, 1879, created the "Cuerpo de Ingenieros agronomos", and the "Junta consultiva inspectora". In 1881, a stallion depôt was added to the "Instituto Agricola de Alfonso XII", which was later attached to the "Estacion pecuaria de la Granja central"; this latter is still in existence.

The Royal Decree of December 9,1887, gave its sanction to the organisation of the Corps of Agricultural Engineers; another decree dated December 13, 1887, provided for the creation of different Experimental Farm Schools ("Granjas-Escuelas experimentales de Agricultura"). The "Granja experimental" of Saragossa contributed in a great measure to the improvement of beet cultivation; this crop has in some parts (in the neighbourhood of Malaga and Motril) replaced sugar cane. The first beet sugar factory was established in 1882 at Cordova; others were subsequently opened at Grenada, Antequera, Aranjuez and Vico.

The oldest of the model farms which still exists is (after the "Granja central", annexed to the Agricultural school of.Moncloa) that of Saragossa, which was established by Royal Decree of September 23, 1881. The same decree also created the model farms of Grenada, Seville and Valladolid; these were, however, suppressed after some years. A Royal Ordinance of June 2, 1882, instituted the "Granja levantina," which is situated in the "Jardin Real" near Valencia; on January 16, 1889, the "Granja-Escuela experimental" of Jerez de la Frontera was created, followed during the same year by the model farm of Corunna, and the next year by that of Barcelona. Those of Valladolid, Valencia, Jaén, Badajoz and Ciudad Real have only been in existence for some ten years; the model farms of Navarre and of Santa Cruz (Teneriffe) are in course of development; those of Melilla (created in 1910), Salamanca (created 1911), Cordova, and the Balearic Isles (created in 1912) are beginning operations.

To the "Escuela Especial de Ingenieros agronomos" and the "Granja Central" are annexed stations for the following branches: agriculture, plant diseases, seed selection, vine growing, stock breeding and machine testing. For a long time, vine-growing stations have existed at Haro, Villafranca del Pandaes, Toro, and Reus (the latter is now transformad into the school of Vine Growing and Wine Making); while those of Calatayud, Cocentaina, Jumilla, Requena, Valdepeñas, Aranda de Duero, Felanitx (Balearic Is.) and Orense are of more recent date. Funds hare been granted for the establishment of 14 "Estaciones de Agricultura generale" at Arevalo, Albacete, León, Lorca, Segovia, Zamora, Asturias, Burgos, Castellón, Motril, Malaga, Cáceres, Fonsagrada and Alcalá de Henares. There is a Sericulture Station at Murcia, and others are about to be established at Aranjuez and Puerto de Santa Maria (Cadiz). Dairy Industry Stations exist at San Felices de Buelma (Santander) and at Nava (Oviedo); and there are Stations for Irrigated Crops at Binéfar (Huesca), as well as at Seville (" Granja provincial de Alfonso XII "), a Rice Culture Station at Huesca (Valencia), and experimental oliveyards at Tortosa (Tarragona), Hellin (Albacete) and Lucena (Cordova).

The law of July 17, 1895, regulates surveying operations. In accordance with Royal Decrees of August 14 and of October 20, 1895, a trial beginning was made in the Province of Grenada. The law of August 24, 1896, provided for the establishment of the survey of crops. In 1899, surveys were made in the Provinces of Cadiz, Cordova,Malaga and Seville. The present detailed survey was regulated by the law of March 23, 1906.

Since 1900 the Government has given a great impetus to irrigation works. The Royal Ordinance of 1903 commanded the publication of the work entitled " El regadío en España " (Irrigation in Spain) compiled by the Council of Agriculture from the reports forwarded from the provinces by agricultural engineers. The Royal Decree of May 11, 1900, reorganized the Hydrological Service; seven divisions were created for hydraulics, and important studies for canals and reservoirs were begun; some of these are in course of construction. At the present time, Spain possesses nearly 4 million acres of irrigated land (counting the areas which are irrigated when water is abundant).

It has long been known that the cotton plant flourishes in some parts of Spain; nevertheless, the Spaniards have almost entirely ceased cultivating this crop. With a view to encouraging the cotton-growing industry, the law of July 19,1904, granted £ 16 000 in prizes (to be awarded over three years), and also exempted the cotton crop from taxation. The Council of Agriculture was charged with drawing up the regulations for the execution of the said law, but their precautionary and restrictive measures (published by Royal Decree on January 28, 1906) made the latter a dead letter.

In conclusion, the writer gives some suggestions as to the part which should be played by the Government and the administration in the encouragement of agriculture, and the best measures to be adopted in order to secure success.

1129 – **The Financial Measures of the Prussian Chamber of Agriculture.** —
ASMIS in *Volkswirtschaftliche Blätter*, Year XI, No. 10-11, pp 135-138. Berlin, June 10, 1913

In order to guarantee for the future the financial resources of the German Chambers of Agriculture, the law of June 30, 1894, dealing with the said Chambers, accords to them the right of levying a certain tax upon the agricultural properties of their district which are over a certain size.

§ 19 of the above mentioned law runs as follows:

" The total tax levied must, in general, not exceed one-half per cent. of the net return of the land tax; only in extraordinary cases, and with the authorisation of the Minister, may this figure be exceeded ". This paragraph

TABLE I — *Taxes levied by the Chambers of Agriculture*

Districts	For the financial year 1903-04		Percentage of net return of land tax						For the financial year 1910-11	
	% of net return of land tax	Total £	1904-05	1905-06	1906-07	1907-08	1908-09	1909-10	% of net return of land tax	Total £
East Prussia	1/2	5 485	1/2	1/2	1/2	1/2	1/2	1/2	17/20	9 150
West Prussia	5/12	3 530	5/12	1/2	5/12	1/2	1/2	1/2	2/3	5 625
Brandenburg	4/10	6 524	4/10	4/10	2/5	7/10	17/20	17/20	1	17 007
Pomerania	1/2	6 705	1/2	1/2	1/2	1	1/2	2/3	2/3	8 906
Posen	1/2	4 826	1/2	1/2	1/2	1/2	1/2	1/2	3/4	7 073
Silesia	1/4	5 764	1/4	1/4	5/12	5/12	5/12	5/12	1/2	11 603
Saxony	1/3	8 443	2/5	2/5	2/5	2/5	1/2	1/2	1/2	12 849
Schleswig-Holstein	4/10	6 728	2/5	4/10	1/2	1/2	1/2	1/2	1/2	8 842
Hanover	1/3	7 396	1/3	1/2	1/2	1/2	1/2	1/2	7/10	15 540
Westphalia	4/10	5 156	1/2	1/2	1/2	1/2	1/2	1/2	1/2	6 392
Hesse-Nassau	—	—	—	—	—	—	—	—	—	—
a) Cassel	1/2	2 717	1/2	1/2	2/3	2/3	2/3	2/3	2/3	3 613
b) Wiesbaden	5/8	2 068	5/8	5/8	5/8	3/4	3/4	7/8	1	3 358
The Rhine Province	1/2	8 384	1/2	1/2	1/2	1/2	3/4	3/4	3/4	12 516
Hohenzollern	—	195*	—	—	—	—	—	—	—	294
Total		73 922								122 768

* Contributed by the Members of the "Verein für Landwirtschaft und Gewerbe".

also mentions that the Chambers of Agriculture must publish an annual balance sheet, and submit the latter to the Minister, while at the same time they have complete autonomy in the management of their bank, and their book-keeping operations.

Table I, which is based upon the "Statistische Nachweisungen aus dem Gebiete der Landwirtschaftlichen Verwaltung von Preussen", shows how during recent years the Chambers of Agriculture have used the power entrusted to them.

This table reveals a tendency to the progressive increase of the tax; while in 1913 there were still seven out of the thirteen Chambers of Agriculture of Prussia which had not reached the legal limit of a levy of ½ per cent. on the net return of the land-tax, and only one which had already over-stepped that limit, in 1910 none of them had remained within the limit, and nine of them had already, with the authorization of the Minister, passed it. The total sum of the taxes collected by the Chambers of Agriculture was about £ 70 000 in 1903, and amounted in 1910 to about £ 120 000.

Table II shows the total expenses of the different budgets of the Chambers of Agriculture since 1903.

After a comparatively slight increase in the expenditure from 1903 to 1904, since the latter date there has been a regular increase of about £ 50 000 in the annual expenses of all the Chambers of Agriculture, since they rose from about £420 000 in 1904 to about £700 000 in 1910. This increase is noticeable in all the clauses of the budget, but especially in the one dealing with the encouragement of forestry, which has risen from £3100 to £11200, *viz.* three or four times the original sum.

The chief increase in expenditure is furnished by the sections providing for the encouragement of scientific work and instruction, and for the promotion of stock breeding. These two sections alone represent the chief work of the Chambers and account for over half their expenditure.

The progressive increase of the receipts corresponds, in some measure, to that of the expenses. The receipts proper to the Chambers are by far the largest and they have increased much more rapidly than the Government grants. Indeed, since 1903 the receipts proper of the Chambers of Agriculture have risen from £230 000 to £460 000, while during the same period the Governmental grants have increased from £120 000 to £190 000.

As appears on comparison with Table I, the increase in the expenses proper of the Chambers does not so much depend upon the increase of the land-taxes (*i. e.* their more strict enforcement) as upon the larger receipts from other sections of the Chambers (duties, school fees, sale of publications, etc.).

The figures given show very clearly the extraordinary development of the work of the Prussian Chambers of Agriculture.

TABLE II. — *Budget of the*

	EXPENDITURE					
	I	II	III	IV	V	VI
Financial Year	For scientific objects and instruction	For veterinary attendance	For the encouragement of stock breeding	For the encouragement of fish breeding	For the encouragement of forestry	For the encouragement of fruit growing, vine growing and horticulture
1	2	3	4	5	6	7
	£	£	£	£	£	£
1903 . . .	116 857	24 938	95 503	2 778	3 113	12 529
1904 . . .	120 317	21 480	98 805	2 392	4 120	14 603
1905 . . .	132 363	34 224	105 497	2 497	5 176	15 055
1906 . . .	138 152	36 799	111 459	2 951	6 247	14 518
1907 . . .	161 839	37 675	131 190	3 386	6 616	16 376
1908 . . .	172 974	40 018	135 891	3 572	7 252	16 060
1909 . . .	213 505	40 478	147 625	5 030	8 238	20 611
1910 . . .	255 305	43 774	155 391	5 773	11 150	18 412

In 1910 the "Verein für Landwirtschaft und Gewerbe" in Hohenzollern was

	632 ½		915	1 ½		54

N. B. — The great increase in the figures in column 2 « Scientific objects and instruction», that the cost of periodicals and other publications of the Chambers was no longer charged instruction.

1130 - Resolution of the Swedish Authorities on the Subject of the Future Position of the Swedish Station for the Improvement of Seeds. — *Sveriges Utsädesförenings Tidskrift*, pp. 142-223. 1913.

The Svalöf Station for the improvement of field crops, founded in 1886 by private initiative, has hitherto belonged to the Swedish Association for the Improvement of Seed, notwithstanding the fact that the increasing subventions granted by the State have rendered it more and more dependent upon the Government. (1)

Owing to the always greater extension of its work and to the desire

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(1) See Dr. HJALMAR NILSSON'S original article: « The Swedish Institute for the Improvement of Field Crops at Svalof », *B.* June 1913, pp. 834-843. (*Ed.*).

Chambers of Agriculture.

VII Grants to agricultural societies and for the encouragement of agriculture in general	VIII Administration of the Chambers	Total expenses	RECEIPTS Total receipts	Government grants	Other grants from Provinces, ecc.	Receipts proper
8	9	10	11	12	13	14
£	£	£	£	£	£	£
69 976	77 771	403 465	399 823	123 628	39 796	236 399
76 461	75 779	414 255	417 829	131 775	38 844	247 210
73 878	92 350	459 871	455 373	138 647	39 631	277 095
101 280	97 115	508 519	508 343	146 476	43 195	318 672
101 934	126 227	585 242	572 040	162 068	49 561	360 412
137 366	112 144	625 276	616 015	182 355	55 284	378 377
107 278	112 692	655 456	659 633	179 678	56 530	423 425
123 964	90 049	703 775	697 804	187 492	56 427	453 885

included for the first time. It furnished the following figures:

186	163	1 952	1 899	1 471	15	413

and the large decrease in the administrative expenses (column 9) in 1910 are due to the fact
to administrative expenses, but to the fund for the promotion of scientific objects and

to give the employees of the establishment a surer and more advantageous position, a request for the increase of the subvention was made (the increase is so considerable that out of the total required revenue, estimated at £7 414, the subvention alone figures for £4 950), and the question was raised whether the State should not take over the establishment as one of its institutions.

This change was supported by the Royal Direction of Agriculture (K. Landtbruksstyrelsen), which proposed however that the establishment should be managed by a special board nominated by the King and consisting of seven members.

In order to ensure intimate cooperation with the Central Institute that the State possesses at Stockholm, in which other branches of agricultural experimentation are carried out, it was proposed that two of the members should be on the board of both of these institutions.

According to the measures proposed by the Government and approved by Parliament, the establishment will continue to belong to the Swedish Association for the Improvement of Seeds, in order that it may preserve that liberty of form which seems to have been so favourable to its development. The managing committee will consist of seven members, of whom five will be nominated by the Government and two by the Association for the Improvement of Seeds; a close cooperation with the State Central Institute will be obtained by means of two members belonging to both boards and by the discussions of the scientists of the two institutions. A laboratory will be installed for the chemical experiments required by the establishment. The State subvention is fixed at £4950 for the year 1914. It is estimated that the Association that receives the improved seeds and disposes of them commercially will give £2 200, while other sources of revenue will yield £264.

In case the sum that the commercial association will have to pay according to the agreement approved by the Government should exceed the sum estimated in the budget, the excess will be put aside as an asset for the budget of the following year, thus allowing the contribution of the State to be diminished.

AGRICULTURAL SHOWS AND CONGRESSES

1131 - Agricultural Shows.

Belgium.

1913. Nov. 8-10. Brussels. — Poultry show organized by the Brabançonne Club. Address to: M. Pirard, Nivelles, or M. W. Collier, 97 Rue des Cailloux, Jette.

Nov. 8-10. Borgerhout (Antwerp). — National poultry show organized by the "Neerhof" Society of Borgerhout. Address to the secretary: M. Eug. Dierkx, Chaussée de Turnhout, 221, Borgerhout, Antwerp.

Nov. 15-17. Renaix (East Flanders). — International poultry show organized by the Pigeon Club. Address to the president: M. Otto Rose, Renaix.

Nov. 15-17. Charleroi. — International rabbit show organized by the "Cunicole Club" of the Charleroi valley. Address to: M. Pévenasse (secretary of the club), Charleroi

Nov. 29-30. Ghent. — Annual international poultry show organized by the "Neerhof" Poultry Society. Address to the secretary: M. A. Heyndrickx, 3 Rue du Saint Esprit, Ghent.

Dec. 14-15. Mont-sur-Marchienne. — National poultry show organized by the "Cercle avicole et cunicole". Address to: M. Léopold Germain, Place du Wez, Mont-sur-Marchienne.

Dec. 20-22. Antwerp. — Eleventh international poultry show, organized by the "Cercle avicole anversais". Address to: 28, Rue Torfs, Antwerp.

1914. Feb. 7-9. Iseghem (West Flanders). — Fourth international poultry show organized by the "Hoenderbond 't Neerhof". Address to: M. Valère Laridon, Café Royal, Iseghem.

France.

1913. Nov. 12-16. Paris, Grand Palais. — International poultry show organized by the "Société Nationale d'Aviculture de France". This show will include fowls, ducks, geese, turkeys, rabbits, pigeons and dead poultry; there are a great many prizes in kind, an object of art offered by the President of the French Republic, money prizes from the Ministry of Agriculture and the General Council of the Seine, gold and silver medals, etc.

1914. Jan. 17-19. Lille. — Fifteenth international poultry show organized by the "Les Aviculteurs du Nord" Society. Address to the general secretary: M. Emile Desreumaux, 92 Rue Franklin, Roubaix, Nord.

March. Nice. — General agricultural and horticultural show organized by the "Societé Centrale d'Agriculture et d'Horticulture". Address to the secretary: 113, Promenade des Anglais, Nice.

May - November. Lyons. — Permanent horticultural show, comprising: fruit-bearing and ornamental plants; instruments, machines and apparatus for use in the various branches of horticulture; plans, designs, books and publications on the subject. There will be three temporary shows of horticultural produce, as follows: June 5-9, Sept. 4-9; Nov. 21-27. Horticulturists and amateurs wishing to exhibit should make application in writing to the Mayor (M. le Maire de Lyon, Secrétariat de l'Exposition, Hôtel de Ville, Lyon), twenty days before the opening of each of the shows, indicating the number and nature of the exhibits and the space required.

Germany.

1913. Oct. 22-23. Königsberg. — Sixty-first show and sale of live stock, organized by the "Ostpreussische Holländer Herdbuch-Gesellschaft". The catalogue of the animals shown may be obtained from the offices of the society: Beethovenstrasse 24-26, Königsberg i. Pr.

Nov. 22-23. Karlsruhe (Baden). — Rabbit show organized by the "Badenia" Rabbit Society..

1914. May 5-7. Berlin. — Thirty-eighth Berlin Fat Stock Show.

German East Africa.

1914. Daressalam. — General exhibition for German East Africa, organized by the Permanent Exhibition Committee for German Industries ("Standige Ausstellungs-Kommission für die deutsche Industrie"). Address: Berlin, N. W. 40, Roonstrasse 1.

United States of America.

Cattle shows and fairs:

1913. Oct. 28 - Nov. 7. Jackson, Mississippi.
Nov. 3-8. Phoenix, Arizona.
Nov. 5-12. Shreveport, Louisiana.
Nov. 22-29. Fort Worth, Texas.

Horse shows and fairs:

Nov. 15-22. New York.
Nov. 24-29. Fort Worth, Texas.
Dec. 1-6. Chicago.

1132 - Agricultural Congresses.

United States of America.

1913. Oct. 22.-Nov. 1. Tulsa (Oklahoma). — Eighth International Dry-Farming Congress. Applications for the report (costing one dollar) should be addressed to: Sir John Burns, Executive Secretary-Treasurer, International Dry-Farming Congress, Tulsa, Oklahoma.

CROPS AND CULTIVATION.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

1133 - **On the Circulation of Sulphur and of Chlorine on the Earth, and on the Importance of this Process in the Evolution of Soils and in the Vegetable World.** — KOSSOVITCH, P. (Bureau for Agricultural Science of the Scientific Committee of the Central Administration for the Organization of the Land and of Agriculture). in *Russisches Journal für Experimentelle Landwirtschaft*, Vol. XIV, No. 3, p. 181. German Edition, p. 218. St. Petersburg, 1913.

The writer treats specially the following subjects :

I. The chlorine and sulphur contents of rocks and soils

II. The quantities of chlorine and sulphur which are brought to the surface of the earth and to the soil by atmospheric precipitations.

III. The quantities of chlorine and sulphur that are washed out of the soil by subsoil waters.

IV. Part played by the chlorine and sulphur conveyed by the atmosphere in the evolution of the soil.

V. Chlorine and sulphur content and requirements of plants.

VI. General considerations on the circulation of chlorine and sulphur in nature.

CHAPTER I. — *The chlorine and sulphur contents of rocks and soils.*

On the basis of analytical data, mostly taken from the existing literature on the subject, the writer comes to the following conclusions :

1) *Crystalline eruptive rocks* rarely contain more than 0.1 per cent of chlorine ; the most widely spread rocks generally contain still less, mostly only traces. The amount of sulphur in the same rocks is higher than that of chlorine and often exceeds 0.1 per cent.

2) *In clastic and sedimentary rocks* chlorine in slightly soluble form is completely lacking ; it is present only in the form of easily soluble salts, generally in traces.

3) *In soils*, chlorine in slightly soluble forms is not present ; the traces that have been observed are due to easily soluble salts. Sulphur is present in the soil in certain quantities in slightly soluble form, but they are not large ; according to available data, the total amount of sulphur in the soil is found in the humous layer, and is 0.04 per cent. corresponding to 0.1 per cent. of SO_3 ; in soils rich in humus, such as the Chernoziom, it reaches 0.1 per cent. The sulphur contents of the soil decrease considerably with the depth.

CHAPTER II. — *Chlorine and sulphur in atmospheric precipitations.*

On the strength of material collected in eight localities of European Russia and of the data available for other countries, which are chiefly taken from N. H. J. Miller's treatise " The amounts of nitrogen as ammonia and as nitric acid, and of chlorine in the rain-water collected at Rothamsted " (*The Journal of Agricultural Science*, Vol. 1, Part 3), the writer believes himself justified in drawing the following conclusions.

A. *For Chlorine.*

1) The chlorine content of the several atmospheric precipitations varies in different parts of the world and within very wide limits: from 0.4 to 71.9 per million. In the analyses made for Russia the lowest chlorine content found in one determination was 0.42 per million (Shatilov Experiment Station), the highest 58.11 (Borovoje Forest Experiment Station).

2) The yearly averages of the chlorine content of atmospheric precipitations varies in the different parts of the world within much narrower limits: from 1.46 per million (Konstatinov Meteorological Observatory in the neighbourhood of St. Petersburg) to 9.72 (Island of Ceylon), when Guardia in Spain is not considered, in which locality the exceptionally high figure of 31.20 has been recorded. For the localities in Russia which have been examined the differences are still smaller, the lowest chlorine content (Konstantinov Observatory) being 1.46 and the highest (Borovoje) 4.00. In general it may be assumed that the atmospheric precipitation of the interior of Russia ranges in chlorine content between 2 and 3 per million.

3) The amount of chlorine contained in the atmospheric precipitation depends chiefly on the position of the locality with regard to the seas and oceans; on approaching the latter the amount of chlorine increases. Also in regions which border on salt lands the precipitations may be richer in chlorine. Generally slight precipitations contain more chlorine than the heavier ones.

4) The quantities of chlorine which fall in one year with the atmospheric precipitations per unit of area vary also very considerably in the various parts of the world. According to available data the lowest quantity of chlorine was observed at the Konstantinov Observatory, namely 7.09 lbs. per acre; the highest at Guardia in Spain, 399.5 lbs. per acre. But the yearly accession of chlorine in most territories varies between 8.92 and 22.30 lbs. per acre. Among the Russian localities examined the first place belongs in this respect to the Forest Institute (near St. Petersburg) where each acre received 14.98 lbs. of chlorine.

B. *Sulphuric Acid.*

1) The lowest content in sulphuric acid per million parts of atmospheric precipitation sank in the single determinations lower than the chlorine content, namely to 0.28 of SO_3 (Sapolje Experiment Station). The maximum was 90.2 of SO_3 at the Forest Experiment Station at Marinpol.

The *yearly average* of sulphuric acid in the precipitation in the Russian territories that were investigated was 1.93 (Shatilov Experiment Station) and the highest 14.17 (Mariupol Forest Experiment Station). At localities within the area of influence of large cities, factories, railaways, etc., the amount of sulphuric acid contained in the atmospheric precipitations has been determined by the writer to be above 10 parts per million, while in the country it varies between 2 and 3.

2) The quantities of sulphuric acid per unit of area which fall to the ground with the precipitations vary considerably in the localities examined. Places

which are not under the influence of chimney smoke get yearly about 8.92 lbs of SO_3 per year. In the neighbourhood of towns and industrial works the yearly amount reaches almost 72 lbs. In such localities the greatest portion of the sulphuric acid falls in winter. Thus, for instance, at the Forest Institute one-third falls during the summer half-year and two-thirds during the winter half. Localities in the country do not show much differences in the quantities that fall during the various seasons.

CHAPTER III. — *The quantities of chlorine and sulphur contained in subsoil waters.*

On the basis of theoretical speculations the writer gives the following characters of subsoil water:

1) The percentage of chlorine and sulphur in the water in the soil and subsoil is in general higher than that in atmospheric precipitations.

The general and fundamental cause of this greater percentage is the evaporation, both directly from the soil and through vegetation, of a part of the water received as atmospheric precipitation.

2) As the ratio between the water that penetrates into the soil from the atmosphere and that which evaporates varies between wide limits, so do the relative chlorine and sulphur contents of soil and subsoil water vary greatly. In special cases these contents increase owing to a whole series of concurring causes.

3) The percentage of chlorine and sulphur in the soil water of any locality may, under certain conditions and when the amounts of these elements contained in the atmospheric precipitations are known, furnish data by means of which the evaporation of water from the soil or the relative quantities of soil water that are formed, may be determined.

4) The chlorine and sulphur content of the water in the soil varies not only with the locality, but from year to year and from season to season, and changes in the course of years.

CHAPTER IV - - *Part played by the chlorine and sulphur, which are conveyed by atmospheric precipitations, in the evolution of the soil.*

The writer considers exhaustively the two following questions: firstly, what length of time is necessary for the chlorine and sulphur of the atmosphere to transform a soil into a salt soil when there is no formation of subsoil water; secondly what is the least quantity of subsoil water necessary in order to carry away all the chlorine and sulphur introduced from the atmosphere. At the conclusion of the chapter the writer formulates the following propositions:

1) As primitive rocks contain only small quantities of chlorine and sulphur, and these in the processes of weathering and soil forming are easily transformed into soluble compounds and rapidly leached out, the natural

consequence would be a relatively rapid impoverishment of the soil in these two elements, until their complete disappearance took place. As further the development of plants is impossible in the absence of sulphur, so is a continuous introduction of sulphur from the atmosphere a necessary condition for vegetation and for the evolution of the soil.

2) In soils and subsoils in which, in connection with a dry climate, underground waters are not formed, an accumulation of sulphur and chlorine due to atmospheric precipitation must take place. If it be assumed as an approximation that the soil receives from the atmosphere only 4.46 lbs. of chlorine and 4.46 lbs. of SO_3 per annum (which corresponds to about one-half of the smallest amounts of these substances which are received per acre and per annum), the author calculates that it would take 12000 years to collect 0.5 per cent. of each of these substances in a layer 3ft. 3 in. deep; in this case it would be a decidedly salt soil which would contain about 1 per cent. of chlorine and sulphur compounds But to render a soil too salty for most cultivated crops, which it becomes when it contains 0.05 per cent. of chlorine, 1200 years would be sufficient, and these from a geological point of view constitute but a brief period.

3) If, on the contrary, there is formation of subsoil waters, it requires great quantities of them to leach out completely the chlorine and sulphur compounds conveyed to the soil by atmospheric precipitations. Thus the quantities assumed above, namely 4.46 lbs. of chlorine and the same of SO_3 would require about 720 cub. ft. of water per acre to leach them out as a 0.01 per cent. solution, which would be equal to a layer of water of about 0.2 inches; consequently the formation of a relatively insignificant quantity of subsoil water is sufficient to prevent an accumulation of chlorine and sulphur compounds in the soil.

CHAPTER V. — *Quantities of chlorine and sulphur contained in and required by plants.*

The writer discusses these points principally in connection with sulphur. On the strength of the available Russian and North American analyses the following conclusions are arrived at:

1) Determinations of sulphur content carried out with all due precautions on the plants themselves, not on the ash, show that cultivated crops are relatively rich in this element: in some of them, such as cabbage, turnips and onions, the sulphur content is higher than the content in phosphorus. In other plants, for instance red clover, lucerne and sugar beets the two elements are present in equal quantities; cereals especially are poor in sulphur, containing about twice as much phosphorus as sulphur.

2) According to the above data, the sulphur content, expressed as SO_3 and referred to air dry matter, ranges in the grain of cereals from 0.29 to 0.45 per cent.. in straw between 0.26 and 0.55 per cent. Clover hay contains 0.41 per cent. of SO_3, lucerne hay 0.50 per cent. Peas contain 45 per cent. beans (*Phaseolus*) 0.58 and soy beans 0.85. In some crucifers the sulphur

content exceeds 1 per cent.: in turnips it is 1.85 and in cabbage 2.05 per cent. of SO_3.

3) The quantities of sulphur which are removed by average crops from an acre maynbe expressed by the following figures: for cereals 6.25 to 8.92 lbs, of SO_3 (in crop of 1338 lbs. of grain and 1962 lbs. of straw per acre); for red clover 16.06 lbs. (4014 lbs, of hay); for lucerne 26.76 lbs. (53.52 lbs. of hay); sugar beets about 44.6 lbs and cabbage 65.13 lbs. (in a crop of 3212 lbs).

4) The sulphur derived from atmospheric precipitations is sufficient to satisfy the wants of relatively abundant crops of cereals only, but on condition that there be no leaching out of sulphur; for if there is any such loss, the cultivation of such plants unless accompanied by appropriate manuring will gradually lead to a shortage of sulphur and the crops will diminish until an equilibrium gets established bewoeen the sulphur brought by the atmosphere and that taken up by the plants and leached out by subsoil water.

5) On the other hand, in localities situated near towns and industrial centres, the wants of such plants as are most exacting in their sulphur requirements can be completely satisfied by the quantities furnished by the atmosphere. In making and judging experiments on the requirements of sulphur in the soil the above mentioned great differences in the amounts of sulphur given up by the atmosphere according to locality must be taken into account. This especially in treating the question of soil sickness in connection with clover and in dressing clover with gypsum.

6) The reserves of sulphur in the soil cannot be considered as being large in comparison with the requirements of plants as to this element. An average sulphur content of the soil (in the upper layer one foot deep 0.1 per cent. SO_3, in the next 2 ft. 3 in. 0.025 per cent.) amounts to about 5085 lbs. per acre in a layer 3ft 3 in. deep; one half of this amount corresponds to 285 cereal crops or 70 lucerne crops.

All the preceding data and considerations show that in certain cases an impoverishment of the soil as to sulphur and a shortage of this element for the nutrition of plants is possible, and consequently that sometimes for a succession of heavy crops the introduction of sulphur by means of suitable manuring becomes necessary.

CHAPTER IV. — *General considerations. On the circulation of chlorine and sulphur on the globe.*

It is specially emphasized that at present the circulation of chlorine con sists chiefly in a mechanical transport between the land, the seas, and the atmosphere, and in the form of that simple combination in which chlorine is prevalently found.

The circulation of sulphur is considerably more complicated: on the one hand sulphur is subject to a continuous passing from an inorganic to an organic form and vice-versa, on the other it undergoes oxidation and reduction processes in most of which micro-organisms take part.

1134 - **The Condition of Soil Phosphoric Acid Insoluble in Hydrochloric Acid.** — FRY, W. H. (Scientist in Soil Laboratory Investigations, Bureau of Soils, U. S. Department of Agriculture), in *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 8, pp. 664-665. Easton, Pa., August 1913.

The official method for the analysis of soils is accomplished by digesting a known quantity (10 grams) of the soil in hydrochloric acid, specific gravity 1.115, for ten hours on a steam or water bath, and then analysing the solution thus obtained for the constituents which it is desired to determine. This method does not invariably give the total amount of phosphoric acid present in the soil analysed. The writer gives the values obtained in the study of the chemical composition of Maryland soils ; the average percentage of phosphoric acid extracted was about 57.6 per cent. In the same manner a series of Virginia soils, in every case except one, gave less amounts of phosphoric acid than the total amount obtained by the fusion method.

There are two explanations for this :

a) The phosphoric acid not extracted by the official method is present in the soil in compounds insoluble in the acid used.

b) It is present in a soluble from which it is protected from the action of the acid.

We have no means of directly testing the first of these possibilities. Several mineral phosphates have, however, been found which their finders state are insoluble in hydrochloric acid. None of these insoluble phosphates however have been discovered in the soils examined by the Soil Bureau ; if they do exist in them the quantity present must be extremely small. Further the amount of insoluble phosphoric acid present in minerals which do not carry the former as an essential ingredient, or which is present in other forms derived from the interaction in the soil solution, must be very small indeed.

In regard to the second possible explanation, mineralogical analyses have shown that a very large number of soils contain apatite, a hydrochloric acid-soluble calcium phosphate, enclosed in quartz grains. Such soils were subjected to acid digestion, and the apatite was found still inclosed in quartz, and apparently unattacked.

In conclusion, it may be said that possibly a very minute quantity of phosphoric acid is present in soils in compounds which are insoluble in hydrochloric acid, but a large part of the phosphoric acid not extracted is present in a soluble form, *i. e.*, as apatite, which is protected from the action of the acid.

1135 - **The Question of the Inoculation of New Crops on Moor Soil.** — RAMM, E. in *Illustrierte Landwirtshaftliche Zeitung*, Year 33, No, 66, p. 597, 1 fig. Berlin, August 16, 1913.

The inoculation of new crops on moor (1) soil, whether by means of inoculated soil or of pure cultures, is a matter of much difficulty when it is a question of thus treating hundreds of acres. For this reason, attempts have for many years been made on the State farm in the Wiesmoor to substitute a dressing of nitrate of soda (180 lbs. per acre) for inoculation. The attempt has been most successful: the crops grew well right from the start and developed in a thoroughly satisfactory manner.

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(1) We translate the German "Hochmoor" as "moor", and "Niedermoor" as "fen"; cf. TANSLEY: "Types of British Vegetation", pp. 208-213. (*Ed.*)

From this time, all new crops in the Wiesmoor have been thus prepared; the results have been uniformly successful and no interruptions in the cultivation operations have occurred. In 8 to 14 days after germination, the roots of the clovers and other Leguminous plants show plenty of nitrogenous nodules.

On areas which have not been inoculated or manured with nitrate, the root nodules do not make their appearance until much later, generally not until about eight weeks have elapsed. Further, the crop, as a rule, shows gaps which only fill up after some time.

It should be the task of science to ascertain the source of the bacteria, which, on the application of nitrogenous manure, produce such a general and regular crop of nodules on the roots, and to account for the increased bacterial receptivity possessed by plants with nitrogenous manuring.

The practical results of the experiments on the Wiesmoor show that where new crops must be sown throughout the spring and summer, a nitrogenous manure is less troublesome and much more certain in its effects than inoculation; thus the application of easily soluble nitrogen is preferable from an economic stand-point. With a nitrogenous manure, the success of the newly-sown crops can be more surely reckoned upon, while there are more failures in the case of inoculation. The areas receiving the nitrogenous manure develop so well that the cost of the fertilizer is paid by turning the sowing year to account. If the greater certainty is taken into consideration, a nitrogenous manure is also cheaper than inoculation. Further experiments should show how far the above-mentioned results are affected by the application of nitrate of soda in larger or smaller amounts than the 180 lbs. per acre employed in this case.

1136 – **Experiments on Denitrification.** — TCHIRIKOV TH. and SCHOAUCK, A. in *Izvestia Moskovska o Selskokhosiaistvenna o Instituta*, Year XIX, Part 2, pp 270-285 + figs Moscow, 1913.

Three series of experiments on denitrification conducted at the Agronomic Institute at Moscow.

I. *Influence of moisture on the course of denitrification in the presence of straw in progressive doses.* — Experiments carried out in sandy loam soils at different degrees of moisture: 40, 60, 80 per cent. of the water capacity of the soil. The results obtained were the following:

1. Oats both without straw and in doses of 0.25 to 1 per cent. of the soil in pots. developed best with 80 per cent. of moisture.

2. A diminution in the yield of oats was observed with increasing doses of straw and this with various degrees of moisture.

3. This diminution of yield took place more rapidly with 80 per cent. of moisture; with less moisture it was less intense.

4. In general an increase in the degree of moisture favours the depressing influence of the straw both on nitrate of soda and on sulphate of ammonia.

5. The decrease of yield caused by the application of 0.25 per cent. of straw is equivalent to that caused by a reduction of the degree of moisture to 20 per cent.

II. *Addition of carbonate of lime in the presence of straw.* — The addition of carbonate of lime diminishes the depressing effects of straw considerably if not completely. The favourable effects of carbonate of lime are already noticeable with a dose of 0.25 per cent. of the earth; but on increasing the dose to 1 per cent. there was no further increase of yield.

III. *Action of sugar starch and straw.* — Experiments of cultivation in sand with additions of sugar, starch and straw, in doses of $^1/_8$ to 1 per cent. of the sand. The plants grown (oats and mustard) developed least with sugar, next came starch and straw. As for the balance of nitrogen the writers make the following principal observations:

1. The depressing action on plants caused by the addition of the above mentioned substances is not due to a real denitrification.

2. The nitric nitrogen of the soil gets converted into albuminoid bodies, thus depriving the plants of a considerable part of the assimilable nitrogen.

3. The percentage of nitrogen in plants is the greater the more their development is depressed.

4. The addition of organic substances in the presence of nitrates causes the production of an alkaline medium and in direct ratio to the quantities employed.

PERMANENT IMPROVEMENTS, DRAINAGE AND IRRIGATION

1137 - **Irrigation Resources in California and their Utilization.** — ADAMS, F. (under the direction of FORTIER, S.) — *U. S. Department of Agriculture, Office of Experiment Stations, Bulletin* 254, pp. 95, 9 maps. Washington, June 1913.

For many years the United States Geological Survey has been mapping topography, measuring streams, and studying underground waters in California, and engineers of the Reclamation Service have been looking for possible developments of unreclaimed land. In 1910 the Office of Experiment Stations directed an irrigation census of California, and in 1912 the Conservation Commission of California published three full reports dealing with Northern, Central, and Southern California respectively and the irrigable area of each section, together with discussions of water supplies, their present use, and estimates of future possibilities. The present Bulletin summarises these and records the results of a further series of field investigations made by the Office of Experiment Stations in cooperation with the Conservation Commission during the year 1912.

Irrigation is not equally necessary in all parts of California, neither can the necessity for it be predicted from the annual rainfall. If grain were the only crop grown, but little irrigation would be required in the coastal or in some of the interior valleys of the northern half of the State. Below San Francisco the necessity would increase, becoming absolute in the lower San Joaquin Valley and most of the State south of Tehachapi. But even in the northern part of the State the rainfall occurs almost entirely during the winter, which is the growing period, and during the rainless summer few plants can be grown without an artificial water supply, so that irrigation during the latter season is a distinct advantage in nearly every section of the State.

Northern California, or that portion of the State north of San Francisco, is divided into six irrigation zones: the coastal zone, the mountain valleys to the north, the mountain valleys to the east, a zone of high plateaus and valleys in the north-eastern corner of the State, the Sierra foothills on the western slope of the Sierra range, and the Sacramento Valley. The present extent of irrigated land and possible future developments are estimated as follows.

	Agricultural land — acres	Irrigated at present — acres	Total area to be eventually irrigated — acres
Coastal counties	502 200	2 675	100 000
North-central mountain valleys	435 000	103 850	250 000
North-eastern plateaus and valleys	867 000	161 930	300 000
Feather River valleys (mountain valleys)	158 000	50 600	100 000
Sierra foothills	789 000	45 250	200 000
Sacramento valley	3 449 000	123 500	2 500 000
Total	6 200 200	487 805	3 450 000
	100	7.9	55.6

In a general way it may be said that the irrigated land in Northern California forms but a small percentage of the agricultural land and enjoys a very abundant water supply which is used in a wasteful fashion. If used to the best advantage and with suitable storage, etc., the water resources of this section should be sufficient to increase the irrigated area from 7.9 to 55.6 per cent. of the agricultural land.

Central California, or that part of the State south of San Francisco and north of Tehachapi, is divided into four irrigation zones: the coastal valley, the large central valley of San Joaquin, the Sierra foothills on the wetern slope of the Sierra range and a high zone east of the Sierra range. The agricultural areas irrigated at present or liable to future development are as follows:

	Agricultural land	Irrigated at present	Total area to be eventually irrigated
	acres	acres	acres
Coastal Valley	887 000	82 000	200 000
San Joaquin Valley	7 576 000	1 728 975	3 850 000
Sierra foothills	730 000	10 620	50 000
Zone east of the Sierra	472 000	137 760	200 000
Total	9 665 000	1 959 355	4 300 000
	100	20.3	44.5

In the coastal valley the water is not abundant and is further reduced by the fact that the cities take a heavy toll.[1] Already, one-third of the water used there for irrigation is pumped, and as valuable crops can be grown when water is available, considerable expense may be incurred in order to obtain it. On the whole, good use is made of the water supplies in Central California, and future development will only take place by practising the strictest water economy and, in the case of the coastal valley, by utilizing the underground resources. In the high zone east of the Sierra Nevada the available water supply will be tapped by the Los Angeles aqueduct, now under construction, which will divert 430 cubic feet per second for use in and about Los Angeles.

Southern California, or that part of the State south of Santa Barbara and the Tehachapi Mountains, is divided into six irrigation zones, four of which are more or less coastal, the two others being the Colorado and Mojave deserts:

With regard to the coastal zones, Santa Barbara and Ventura Counties have not, up to the present, utilized their water resources as completely as other parts of Southern California, and the surface flow together with underground supplies might serve to increase the irrigated area 6 ½ times. Development in the Los Angeles and San Gabriel River zone will depend largely on the Los Angeles aqueduct, and in the two other coastal zones no great developments are likely to take place, as the supplies are already well utilized. In the desert zones, the luxuriance of plant growth under irrigation is inevitably bringing about development, though the water resources are limited. Increased supplies will come in part from the Colorado River and in part from underground supplies.

Summarising: "The total area of irrigable land found in the zones of irrigation water supplies, which includes all of the valley lands, the rolling plains of the Great Valley, the arable portions of the Sierra foothills up to about 3000 feet in elevation, and all of the plateau and desert lands to which

	Agricultural land — acres	Irrigated at present — acres	Total area to be eventually irrigated — acres
Santa Barbara and Ventura Counties . . .	509 250	49 656	322 500
Los Angeles and San Gabriel River lands .	441 986	167 454	381 500
Santa Anna River lands	876 671	213 407	279 000
San Diego County	363 668	19 880	87 100
Colorado Desert and River Valleys	1 550 750	279 600	766 500
Mojave Desert	2 328 000	15 489	113 000
Total . . .	6 070 325	745 486	1 949 600
	100	12.3	32

some irrigation water supplies are available, is 21 935 500 acres, of which 3 192 646 acres are already irrigated, and 9 699 600 acres are estimated as the area to be ultimately irrigated. "

The writer states that the results given above are largely statistical, so that the estimates of areas ultimately to be irrigated can only be very approximative. The 1912 investigation dealt chiefly with a detailed study of six typical irrigated areas which are fully described in the Bulletin. The writer repeatedly urges the absolute necessity of a general State control of all water supplies, for in that manner only can they be put to the best use and lead to a maximum development of agriculture in California.

1138 – **The Murrumbidgee Irrigation Scheme in New South Wales.** — *Journal of the Royal Society of Arts*, Vol. LXI, No. 3168, pp. 873-875. London, August 8, 1913.

The soil of the so-called "chocolate" lands in the western part of New South Wales is extremely fertile, but up to the present owing to insufficient rainfall, the land has only been used for grazing sheep and cattle. As the outcome of the work of a Royal Commission, appointed thirty years ago, the State Government has begun work on a gigantic irrigation scheme in the Murrumbidgee River basin.

The waters of the Murrumbidgee are derived from the lofty table lands in the Eastern part of the colony where the rainfall amounts to from 20 to 70 in. per annum; the chief gathering ground is a basin 5 000 sq. miles in extent with only one outlet to the lower country through a deep gorge at a place called Burrinjuick. With a suitable dam here the most perfect natural reservoir is obtained, backing up the river for 41 miles and two important tributaries for 15 and 20 miles respectively, and forming a lake with an area of 29 square miles. "The dam is of Cyclopean concrete, 240 ft. high at its maximum section, and 18ft. wide at the top. The up-stream face is nearly vertical, being slightly battened down to the base. The down-stream face shows a curve concave to the down-stream to 60 ft. below the crest, so as to make the dam 36 ft. thick at that point. Then there is a slope of 1 ½ to 1 for a depth of 90 ft., at which point the dam is 90 ft. thick Then follows another curve in the same direction, for 50 ft. vertical, to a level 40 ft. above the base. From this point the face is vertical, and finishes at 176 ft. from the inner toe of the foundation. In plan the dam will be 784 ft. in length along the crest, which is curved convex to up-stream to a radius of 1200 ft. The wall is being built up in a series of units, each representing the average quantity of concrete that can be placed in one day These units break joint in every direction, so as to imitate masonry construction and minimise defects due to remission of work."

The outlets consist of four 4 ft. 6 in. pipes, passing through the dam near the foundation, and controlled by valves, and two byewashes at the top, one at each side of the dam. The sides and bed of the gorge are of granite, and blocks of this are used for the concrete; sand is also obtained near by. The granite floor is irregular, so that the concrete masses key into the holes, thus preventing any possible movement under the pressure of the water.

The estimated cost of the dam, notwithstanding the high price of the labour, comes to about £ 750 000, which is roughly equivalent to £ 1 per acre-foot of water held back; this is believed to be much less than the cost of any similar work elsewhere; the Assuan dam, which holds up a maximum depth of 75 ft. of water, as against 230 ft. at Burrinjuick, cost £2 7*s.* per acre foot of stored water.

For 220 miles below Burrinjuick irrigation is not required; then a rocky dike at Berembed, near Narandera, forms a convenient point for the diversion of the river. The main irrigation channel is 132 miles long and has a 34-mile branch, as well as distributing channels, and will serve to irrigate a block of land of 1 300 000 acres. At the point of diversion, a flow of 2 000 cubic feet of water per second will be available. The main irrigation canal is 64ft. wide at the water-level with a flow 8ft. deep, equal to a present discharge of 1000 cubic ft. per second; this capacity will eventually be doubled. Distributing canals carry the water to each separate holding. Most of the farms on the area are designed for mixed farming and comprise 50 acres of irrigable land. Some, however, are smaller, while horticultural and workmen's blocks are narrowed down to 10 and 2 acres respectively.

The irrigation settlement will include three towns, about 400 miles away from Sydney. These will be planned on modern lines, and will be provided with factories for the utilization of the produce. Roads will be arranged in such a way that no landowner will be more than a mile and a half from one.

The soils in the Murrumbidgee Valley are suited for irrigation, being loamy, deep, rich and friable. The natural drainage is such as to preclude any necessity for an artificial system. Analyses show that the soils contain an exceptional proportion of potash, and nodular limestone is abundant. The soil displays great bacteriological activity with rapid and vigorous nitrification. Mineral plant food is abundantly present.

All the land within the irrigation area is leasehold, and the lessees have to conform to conditions and regulations that are more or less inseparable from an undertaking that needs more co-operation than among the settlers in more ordinary circumstances. The conditions to be fulfilled are perpetual residence, payment of rent and balance of survey fees, and for value of improvements, if any, on the land when applied for. The rent is at the rate of 2 ½ per cent. per annum on the capital value. Farms are not transferable, with certain exceptions, until 5 years' residence has been completed.

As to the cost of water to the settler, it is fixed at 5*s* per acre-foot during the summer; this water rate is to be reduced by one half during the settler's first year of occupation, then increasing uniformly until the sixth year, when the 5*s* rate is required. The operations of farming on the area have now fairly started, and a certain amount of produce has been sent away to market.

The cost of the present scheme in round figures is approximately as follows: main works, £ 1 650 000; subsidiary channels, £650 0000; cost of land, £ 1 000 000; total cost £ 3 300 000.

MANURES AND MANURING

1139 - **Comparative Manuring Experiments with Crushed Phonolite and 40 per cent. Potash Salts.** — WAGNER, F. Düngungsversuche des Deutschen Hopfbauvereins mit Phonolithmehl (Kalisilikat) in Vergleich zu 40 % igem Kalisalz in den Jahren 1910-1912. — *Praktische Blätter für Pflanzenbau und Pflanzenschutz*, Year XI, Parts 4, 5, 6, pp. 52-53, 67-70, 77-82. Stuttgart, April-May-June 1913.

An account of three year experiments (1910-11-12) carried out at Geisenfeld, Bavaria, by the German Hop-Growers' Association ("Deutsches Hopfenbauverein") at Geisenfeld, Bavaria. The hop garden which was the site of the experiments was planted in 1908; the soil was humous sand (83.4 per cent. of fine soil), infertile and poor in potash (0.107 per cent. K_2O in air-dried fine soil). To a basis of sulphate of ammonia, basic slag and lime were added, for comparative purposes, the crushed phonolite prepared by the "Westdeutsche Eisenbahngesellschaft, Köln, Abteilung Steinbrüche, Brohl am Rhein", and 40 per cent. potash salts. The crops of 1910 and 1911 were failures owing to reasons unconnected with the experiment.

In 1912 the experiments were recommenced on eighteen plots; in twelve there were 4 rows of 20 hills, and in six there were 4 rows of 10 hills. Each hill, received 100 gms. (3 ½ oz.) of sulphate of ammonia, 150 gms. (5 oz.) of basic slag (at 18 per cent. P_2O_5), and 100 gms. (3 ½ oz.) of lime as a top dressing. The potash manure was applied as follows.

Plots 1, 7, 13: 284 gms. of phonolite at 9.87 per cent. potash = 28 gms. K_2O
» 2, 8, 14; without potash —
» 3, 9, 15: 60 gms. potash salts at 46.84 per cent. potash = 28 gms. »
» 4, 10, 16: 142 gms. of phonolite = 14 » »
» 5, 11, 17: without potash —
» 6, 12, 18: 30 gms. of potash salts = 14 » »

Reduced to acres, the results obtained in 1912 are from the financial point of view as shown in Table I.

TABLE I.

Amount of potash	Increase in crop due to the potash manure	Profit (hops at 74*s* 6*d* per cwt.)		Cost of manure and of picking and drying extra crop		Net profit due to the potash manure	
	cwt.	£	*s*	£	*s*	£	*s*
129 lbs. as potash salts (2 oz. per hill) at 2*s* 9*d* per unit.	6.1	22	14	8	2	14	12
64 lbs. *id.* (1 oz. per hill) *id.*	3.7	13	17	4	17	9	0
129 lbs. as phonolite (10 oz. per hill) at 5*s* per unit.	2.0	7	6	3	4	4	2
64 lbs. *id.* (5 oz. per hill) *id.*	0.7	2	15	1	6	1	9

The data respecting the quality of the hops in 1912 are given in Table II.

TABLE II.

Potash manure	Points for appearance, lupulin and aroma (3—15)	Commercial value	
		relative (minimum = 100)	absolute (per cwt.)
129 lbs. of potash as phonolite	9.25	101.0	105*s*
» » » potash salt	9.75	102.5	106*s* 6*d*
64 » » phonolite	9.00	101.5	106*s* 6*d*
» » » potash salt	10.00	105.0	109*s*
None	9.75	104.3	109*s*

1140 – **The Sulphur Industry and Trade in the United States.** — PHALEN, W. C. (U. S. Geological Survey) Sulphur Pyrite and Sulphuric Acid. — *The American Fertilizer*, Vol. XXXIX, No. 3, pp. 41-56 (41-47) Philadelphia, August 9, 1913.

The production of sulphur in the United States since 1880 is shown in the following table.

Production of sulphur in the United States, 1880-1912 *in long tons.*

Year —	Quantity —	Value — $
1880	536	21 000
1881	536	21 000
1882	536	21 000
1883	893	27 000
1884	446	12 000
1885	638	17 875
1886	2 232	75 000
1887	2 679	100 000
1888	—	—
1889	402	7 850
1890	—	—
1891	1 071	39 600
1892	2 400	80 640
1893	1 071	42 000
1894	446	20 000
1895	1 607	42 000
1896	4 696	87 200
1897	2 031	45 590
1898	1 071	32 960
1899	4 313	107 500
1900	3 147	88 100
1901	241 691*	1 257 879
1902	207 874*	947 089
1903	233 127*	1 109 818
1904	127 292	2 663 760
1905	181 677	3 706 560
1906	294 153	5 096 678
1907	293 106	5 142 850
1908	369 444	6 668 215
1909	239 312	4 432 066
1910	255 534	4 605 112
1911	265 664	4 787 049
1912	303 472	5 256 422

* Including the production of pyrite.

In determining the value of most of the sulphur produced in 1912, the current market price in New York was taken and the mine values were computed from it. Prices remained fairly constant throughout the year at $ 22 to 22.50 per long ton for prime Louisiana sulphur.

Quotations on other sulphur per 100 *lbs.*

	$		$
Rolled sulphur	1.85	to	2 15
Flour »	2.00	»	2.40
Sublimed »	2.20	»	2 60

Sulphur was produced chiefly in Louisiana, and in smaller quantities in Nevada and Wyoming in 1912. The production of the individual States cannot be given without divulging confidential information. Utah, which has produced on a small scale in previous years, reported no output in 1912.

Trade. Imports and Exports. — The imports of sulphur during the last five years are shown in the following table:

Sulphur imported and entered for consumption in the United States from 1908 *to* 1912, *in long tons*

Year	Crude		Flowers of sulphur		Refined		All other		Total Value
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
		$		$		$		$	$
1908 . . .	19 620	318 577	793	22 562	693	17 227	30	4 013	362 379
1909 . . .	28 800	492 962	770	23 084	966	26 021	53	7 565	549 632
1910 . . .	28 656	496 073	1 024	30 180	1 106	25 869	47	6 489	558 611
1911 . . .	24 200	434 796	3 891	83 491	985	24 906	68	9 643	552 836
1912 . . .	26 885	494 778	1 311	39 126	1 665	40 933	66	9 137	583 974

Crude sulphur imported from the following countries, from 1910 *to* 1912, *in long tons.*

Countries whence exported	1910		1911		1912	
	Quantity	Value	Quantity	Value	Quantity	Value
		$		$		$
Canada.	5	160	—	—	—	—
United Kingdom	7	199	11	248	—	—
Italy.	10 704	201 993	8 031	156 157	2 348	46 003
Japan	17 377	283 232	16 185	279 991	24 505	447 946
Other countries	554	10 404	23	329	32	829

The exports during the last three years were as follows:

Total exports of sulphur from the United States from 1910 *to* 1912, *in long tons.*

Year	Quantity	Value
		$
1910	30 742	552 941
1911	28 103	545 420
1912	57 736	1 076 414

It is to be noted that in 1910 the sulphur production of the United States amounted to 3147 tons; the imports during that year were 167 696 tons, of which 166 285 were crude sulphur chiefly from Sicily. Thus the domestic production amounted to 1.84 per cent. of the sulphur consumed during that year, while in 1912 against a domestic production of 303 472 tons the imports amounted only to 29 927 tons, the domestic production constituting 91 per cent. of the consumption, and the imports less than 9 per cent. Moreover in the same year the excess of exports over imports amounted to 27 809 tons and the balance of trade in favour of the United States was $ 492 440. The imports from Italy were only 8.7 per cent. of the total, while those from Japan amounted to 91 per cent. For the year 1912 it is estimated that the output of that country cannot be far from 40 000 tons, and it is believed that with the completion of the Panama Canal, United States sulphur may practically displace foreign sulphur on the Pacific Coast (California, etc.).

Further development. — Some new factors of the American sulphur industry are the foreign expansion of the Union Sulphur Co. of Louisiana and the new sulphur mines in Texas and in Wyoming.

The Union Sulphur Co. is reported to have negotiated with the city authorities of Rotterdam (Holland) for the leasing for twenty-five years of a suitable tract of land having access to one of the harbours upon which to build a sulphur mill and other buildings. The city has offered a tract of land 330 × 420 feet with dock facilities on the Maas Haen, for which an annual rental of $ 4200 is asked. The firm contemplates making Rotterdam its headquarters in Europe, and already a new refinery with grinding and storage facilities is being built. During 1912 the company is stated to have acquired storage facilities at Hamburg (Germany). Besides these recent additions to its European distributing centres the company has refineries and storage plants at Marseilles and Cette in France. These plants will be supplied by the company's own fleet of ships, to which two vessels were added in 1912.

In 1909 and 1911 the occurrence of suphur near Bryan Heights at the mouth of Brazos River, in Brazoria County, Texas, was reported. Actual mining operations however were not begun till November 1912 by the Freeport Sulphur Co. The work has been somewhat intermittent owing to difficulties inherent in the beginning of an operation of this kind.

The sulphur is to be obtained by a process similar to that employed in Louisiana, that is the sulphur is melted in the ground by superheated water and is pumped to the surface by an air lift. Up to the middle of February 1913 seven wells had been sunk.

Bryan Heights is well located for the exploitation of the sulphur. It is only 3½ miles from the Freeport harbour. The detailed results of the drilling operations have not yet been published, but it is reported that the sulphur deposit was found at a depth varying between 900 aud 1100 feet. The sulphur beds themselves ranged in thickness from a few inches up to 7 feet. Fuel oil will be used in the machines for raising the sulphur and the oil can be delivered at Freeport at a low cost.

Other sulphur deposits have been found in Wyoming, but it is still doubtful whether they can be utilized unless the local demand becomes great.

Lastly the deposits of sulphur situated on White Island in the Bay of Plenty, New Zealand may, prove of interest for the markets of the Pacific. Work began on these deposits in April 1912 and the tonnage of sulphur estimated in them is very large.

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

1141 - **Experiments on the Availability of Glucosamine Hydrochloride as a Source of Nitrogen for the Nutrition of Corn *(Zea Mays)* and Beans *(Phaseolus multiflorus)*.** — HAMLIN, M. L. in *The Journal of the American Chemical Society*, Vol. XXXV, No. 8, pp 1046-1049. Easton, Pa., August 1913.

Two sets of experiments were carried out with 46 and 24 plants respectively, and showed that glucosamine could not be utilized as a source of nitrogen in plant nutrition, owing either directly to its own characteristics, or indirectly to conditions it may have caused, such as the growth of some mould which frequently appeared in the glucosamine solutions.

PLANT BREEDING

1142 - **New Selection Varieties from Alpine Forms of Fodder Grasses.** — VON WEINZIERL, TH. in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 7, pp. 790-820, 2 figs., 10 plates. Vienna, July 1913.

I. INFLUENCE OF THE ALPINE CLIMATE ON PASTURE GRASSES.

Specific alpine plants show a number of the most varied and characteristic morphological and physiological modifications, which are to be attributed primarily to the effect of the alpine climate, and according to C. v. Naegeli should be regarded as " adaptation characters ", in distinction to differences in organic characters which are not directly connected with adaptation to special circumstances, and are more constant.

The writer has for many years been carrying on experiments and studies on the Sandlingalp in the Northern Alps, at an altitude of 1400 m. (4700 ft.); these have shown that on the whole a number of the most valuable and important species of pasture grasses from the plains, and especially the wild forms from higher ground, when grown under alpine conditions, gradually give rise to other forms differing in morphological and physiological characters from their valley-bred ancestors. The most interesting point, and the one of greatest value from the agricultural standpoint, is that by means of continued selection, bearing on the most important characters for fodder plants (resistance to cold, yield of fodder, tillering, early development, etc.) these characters may be further intensified and prove constant under alpine conditions (sub-alpine vegetation region) even after 20 years' cultivation; in this way new varieties of these cultivated plants may be raised.

When it is also taken into consideration that many of the parent plants dating from 1891 which have undergone this gradual transformation, are still growing in the experiment garden on the Sandlingalp, it appears to the writer that his selection experiments with Gramineae may be regarded as a further and conclusive proof of the truth of the theory advanced by Lamarck and upheld by C. von Naegeli, that environment has a direct effect upon the individual plant and that modifications arising through direct environmental influence are transmissible.

The persistence and transmission of these acquired characters has certainly resulted in all the forms of Gramineae obtained by the writer through selection; party through mass selection and partly through line selection based on special forms and qualities.

The yearly increasing deviations in all the species and varieties consisted in the appearance of purple colour on the nodes, the leaf-sheaths and the flowering glumes, and then in the increasing production of sterile (leafy shoots) and enhanced tillering generally (Bestockungszahl) (1) ,larger number of leaves, increased breadth of the leaves, shortening of the internodes; also in the formation of special means of protection, as the waxy covering in cocksfoot (*Dactylis glomerata*) and *Sanguisorba dodecandra*, the reduction of serration of the leaves (*Bromus erectus* and *Deschampsia caespitosa*), and finally a reduction of the vegetative period and displacement of the phenological phases in general.

In order to ascertain as far as possible the relations of the climatic influence to these alterations in the alpine grass forms, the most important factors of the alpine, climate, *viz.* temperature, insolation, humidity of the air, rainfall, and the chemical light intensity, were observed regularly during the vegetative period, and it was found that certain direct adaptations depend partly on single and partly on combined climatic factors.

It can be affirmed now that without doubt, chemical light intensity plays a very important part among the climatic factors of alpine districts, and that it directs the formative process of certain organisms of especially variable species, at all events during the earliest stage of their development, giving the impetus to the characteristic laying down and the later shaping of the leaves and stem, that is of the sheath and blade in the one case, and the internodes in the other. The shortening of the latter leads necessarily to a more tufted habit, owing to the side shoots being thereby brought nearer to the main stem; this is shown by most Gramineae cultivated under the influence of the alpine climate.

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(1) The writer understands by this the number of sterile shoots to every culm of the individual plant. Translated lower down as " tillering value ".

II. THE MOST IMPORTANT ALPINE VARIETIES SELECTED FROM PLANTS FROM THE PLAIN.

The writer has bred the following new varieties:

1. *Agropyrum caninum* Schreb.: a variety bred from the wild form of the plain; it resembles Italian ryegrass, but is a persistent fodder grass (especially adapted for alpine green soiling mixtures and alpine meadows).

2. *Arrhenatherum elatius* Mert. et Koch: very suitable for alpine meadows: selected from wild forms.

3. *Arrhenatherum* var. *bulbosum* Koch: a variety well adapted for alpine meadows, selected from wild forms.

4. *Avena pubescens.* Huds: persistent, leafy variety, bred from wild lowland forms.

5. *Dactylis glomerata* L.: alpine form with bloom-covered leaves; descended from wild mountain plants; resistant to rain (ombrophilous).

6. *Festuca arundinacea* Schreb.: alpine form with the typical characters; cold resistant even at high altitutes; leaves soft; very productive, especially suitable for alpine meadows.

7. *Festuca pratensis* Huds.: from wild plants, coming from mountain meadows; a very productive and persistent alpine selected variety.

8. *Festuca rubra* var. *fallax* Hack.: from this tufted variety of *Festuca rubra*, an alpine form was bred with purple nodes and variegated outer pales; it has soft culms and narrow leaves, is cold-resistant and very productive.

9. *Lolium perenne* L.: a persistent alpine form with purple nodes, and keeled, purplish leaf-sheaths; selected from wild individuals growing on the mountains.

10. *Phleum medium* Brügger: a very productive alpine form adapted for meadows and pastures.

Finally we must mention a little-known fodder plant grown by the writer in his alpine experiment garden:

11. *Sanguisorba dodecandra* Mor.: from Val Ambria, Southern Switzerland; the alpine form has bloom-covered leaves and reddish-violet petioles and stems; it is a cold-resistant green crop for the Alps, especially useful mixed with the alpine form of *Agropyrum caninum*, and has a great future before it.

Special mention should be made of some species of plantain grown by the writer on the Sandlingalp and subjected to further selection on the Kragl estate during the last three years; of these the most important is *Plantago serpentina*, an excellent pasture plant of tufted growth; many varieties have arisen during cultivation at lower altitudes. These will be dealt with by the writer in a later paper.

III. BEHAVIOUR OF ALPINE FORMS (ACCLIMATISATION RACES) WHEN CULTIVATED AT LOWER ALTITUDES.

The writer has grown these alpine selection varieties under more favourable vegetative conditions, *viz*, in more sheltered and sunny spots, in order to obtain more seed than could be hoped for, especially in late ripening varieties at an altitude of over 1400 metres.

On the establishment of the Kragl farm (under the writer's direction) in 1908, selection experiments were begun by means of sowing the seed of the required alpine forms and pricking out selected plants, of at least two years of age, from the Sandlingalp garden. Kragl was instituted not merely as a modern pasture-farm for the furtherance of cattle-breeding interests, but primarily to serve in the promotion of botanical research and the seed selection of fodder plants.

The selection garden there lies some 820 m. (2700 ft.) above sea level; it was formerly a State nursery for forest trees, so that the ground was suitable for such experiments without the repeated working necessary in the case of the Sandlingalp. The composition of the soil and the manure used were the same as in the alpine experiment garden.

The following important facts are shown by the elaborate tables drawn up by the writer respecting the development through further selection of the forms obtained at Kragl, as compared with the alpine selection varieties.

1. In general, the number of culms per individual is considerably higher in the varieties which have been further cultivated than in the parent alpine forms, while the number of leafy shoots (and therefore the tillering value) has decreased, with the exception of *Festuca rubra fallax, Poa serotina* and *Phleum Michelii,* in which the tillering value is higher.

If the number of the culms and leafy shoots of the parent alpine form be taken as 1, the following series represents the proportional numbers in the varieties which have been further cultivated.

	Culms —	Leafy shoots —
Festuca pratensis	6.38	0.66
» *arundinacea*	6.25	0.40
Agropyrum caninum	5.67	0.25
Phleum Michelii	4.12	1.63
» *medium*	1.82	0 56
Poa serotina	1.80	1.80
Festuca rubra	1.17	0.86
» » *fallax*	1.07	1.56

2. A remarkable character of all these varieties under further cultivation is the greatly increased yield of seed, which in *Festuca arundinacea* is nearly twenty-four times as much as in the parent alpine form.

In correlation with this is the increase in the number of spikelets per individual in the new varieties.

3. In like manner the fodder yield increases in the case of the new varieties, though not to the same extent as the extra seed production; in the selected variety of *Festuca pratensis* it reaches more than ten times as much as that of the parent form.

4. If, as in the case of the number of culms and leafy shoots, 1 is taken for the yield of the parent alpine form per unit area, we get the following figures for the seed and fodder production of the new kinds. These tables clearly demonstrate the superiority of the latter, not only over their parent forms, but also in comparison with the commercial varieties. A comparison between the two tables further shows that the highest seed yield does not coincide with the largest fodder production.

Seed yield of the selected varieties.

	Kragl selected variety	Commericial or original variety
Festuca arundinacea .	23.9	4.4
» *rubra fallax* . .	16.6	5.5
Agropyrum caninum .	11.2	—
Phleum medium . . .	9.3	5.7
Festuca rubra	7.1	3.1
Phleum Micheli . . .	6.7	1.1
Festuca pratensis. . .	3.9	1.4
Poa serotina	2.7	1.8

(Yield of parent alpine form at the Sandlingalp = 1).

Fodder yield of the selected varieties.

	Kragl selected variety
Festuca pratensis . . .	11.8
» *arundinacea*. .	8.3
Agropyrum caninum .	3.6
Poa serotina	2.6
Phleum medium . . .	2.2
» *Michelii* . . .	2.2
Festuca rubra	1.5
» » *fallax* .	1.3

(Yield of parent alpine form at the Sandlingalp = 1).

The new varieties retained their acquired characters for three generations during further selection and multiplication, and these modifications even became intensified. These facts have been determined by the experiments of practical breeders.

IV. The Principal Results of this Work.

These may be summed up under three heads:

1. During the further cultivation, in sheltered, sunny spots in the mountains, of alpine forms bred under the influence of the alpine climate

from lowland grasses, new forms again arise; from these can be bred varieties which are not only far more productive than their parent alpine forms, but are also superior to the best kinds in use or in the trade.

2. The superiority of these varieties is chiefly shown by their seed yield. Thus, the further cultivated form of *Festuca arundinacea* in the third generation bears 23 times as much seed as its alpine parent. The further cultivated varieties have, as a rule, also exceeded their alpine parents in fodder production.

3. Experience shows that the seed production of all cultivated grasses decreases considerably, normally in their fourth year, and this falling off also occurs in the case of the new selection varieties; to obtain a larger and purer seed yield it is therefore necessary to renew the multiplication plots after some years by either transplanting or sowing new selected seed from the lowland selection garden; the latter must also be restocked with the varieties in question taken from the first selection ground, *i. e.* the alpine experiment garden. This entails a new and important interrelation between the alpine seed-breeding garden and the further cultivation of the alpine varieties in lower places, and also manifests the importance of the alpine seed-garden for the cultivation of fodder in valley farms.

If the data so far obtained do not permit of a decisive opinion being formed, especially as regards the lasting worth of the new selected varieties, they are yet not to be despised, for they open up a new field of work for both scientific research and practical agriculture.

1143 – **Selection of Pigeon-Pea or Rahar (*Cajanus indicus*).** — SIL, S. N., Improvement of Rahar by Selection. — *The Agricultural Journal of the Department of Agriculture, Bihar and Orissa,* Vol. I, No. 1, pp. 25-29 + 4 plates. Patna, April 1912.

Rahar is held in high esteem as a food in India. Its seed coats, young shoots and leaves make excellent fodder for cattle; its branches are used for roofing, basket and thatch work and the dried stalks for fuel. Its obvious importance in the rural economy of the natives makes this plant worthy of study and improvement.

Observations were commenced on Sabour Farm in 1908 with a Saran variety. It was noticed that considerable variation existed among the plants with respect to the following important characters: growth, marking and colour of the plant, plumpness of pod, colour and size of grains, and character of the flower. The variations were recorded as follows:

A. Habit of growth: 1) erect, 2) spreading.

B. Colour of pods: 1) violet, 2) white, 3) striped.

C. Fullness of pod: 1) inflated, 2) wrinkled.

D. Colour of seed coat: 1) reddish-brown, 2) white, 3) black, 4) spotted.

E. Size of grains: 1) large seeded, 2) small seeded.

F. Flower characteristics: 1) standard yellow, 2) standard yellow with red veins.

Among all the multitudinous forms possessing these characters, the writer observed a certain degree of correlation. He found the following correlated characters:

1. Erect type with large grains and entire-coloured pods.
2. Spreading type with small grains and striped pods.
3. Erectness in form with lateness of maturity.
4. Wrinkledness of pod with roundness of grain.
5. Spotted grains with extreme earliness.

Attempts at selection were also made with respect to earliness, wilt resistance and west-wind resistance. Selection work during two seasons produced the following results: 1) Early plants have a low spreading habit and the foliage and fruits small. 2) No morphological character appeared to be correlated with wilt resistance. 3) The thick-podded erect forms were generally more resistant to the west wind. 4) Large pods and seeds were associated with the erect habit of growth.

In the field trials the erect form was always found to be superior to the spreading form; it is now being grown as a general field crop at Sabour.

FORAGE CROPS, MEADOWS AND PASTURES

1144 - **Comparative Experiments on Red Clover of Different Origins at the Svalöf Institute during 1907 to 1912.** — WITTE, H. in *Sverges Utsädesförenings Tidskrift*. 1913, p. 11.

Most of the red clover seed imported into Sweden is described as "Silesian" a small quantity as "Russian." The former brand includes not only seed from Silesia and neighbouring countries, but also that of Hungary, Austria, France, Italy, North America and Chile. Only the varieties resistant to a cold winter are of use in this country, and for the pastures of 3 to 6 years duration, which is the usual system in Sweden except the southern portion, a very hardy and persistent clover is required. Experience has shown that imported clovers vary considerably with respect to their hardiness and persistence, and this has been verified by the experiments conducted at the Svalöf Institute during 1907-12.

Most of the foreign varieties are early in maturity and characterised by erect slightly-branched stems and an early secondary growth, which enables two cuttings to be obtained; but they are of so short duration that the second years' crop is very small.

The largest yields have been obtained from seed from Silesia. Posen, Poland, Bohemia, the Rhenish Palatinate and Galicia, and often the second year's crop has been as large as the first. Moravian seed is somewhat inferior and that of Austria (with the exception of the Austrian countries already named) suffered very badly in the winter. Russian seed was better and equal to the Silesian. The Swiss variety "Matten Klee" gave a poor yield owing to its earliness and tenderness. The American varieties of the pubescent type have all given inferior yields, but their hardiness varied according to the latitude of their origin. The Italian, Brabant, and above all the English and Chilian clovers, were lacking in hardiness and durability. The late varieties from England and Bohemia matured early but they developed somewhat slower than the true Silesian clover.

The late variety, with tall much-branched stems, generally gives only a small aftermath, but its total yield for the first year is equal to that of the early variety; in the second year, in which it gives its biggest crop, it considerably exceeds it. Owing to its persistence (it will last five years), this variety is the only one suitable for pastures of long duration.

Most of the Swedish varieties were of this type, as also were those of Norway, Finland and North Russia. The foreign varieties, with perhaps the exception of those of Finland, were generally inferior to those of Swedish origin. These native varieties showed considerable differences in the periods of flowering and yields, the latter character being generally related to their lateness.

1145 – Manuring Experiments on Alpine Pastures in Carinthia: 1910, 1911, 1912.

— SVOBODA, H., of the Laboratory of the Institute for Resarch and the Examination of Foodstuffs of the Duchy of Carinthia at Klagenfurt. — *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 7, pp. 745-789. Vienna, July 1913.

The results of this work and of two previous reports are given together as follows:

1. The soils of all the alps experimented upon were very poor in P_2O_5, K_2O and CaO. In 100 gms. of air-dried fine earth there were only in 4 cases more than 0.1 gm of P_2O_5. The other eight soils contained considerably less than 0.1 per cent of P_2O_5, namely 0.003, 0.008, 0.017, 0.019 per cent,, etc. The potash content of all the twelve soils was under 0.1 per cent., with a minimum of 0.024 per cent. Only two soils contained more than 1 per cent. of CaO, one upwards of 0.3 per cent, one over 0.2 per cent., five between 0.1 and 0.2 per cent., three under 0.1 per cent.

2. Tilling the Alpine soil gave everywhere good results; no soil can naturally be more benefited by physical improvement than Alpine soil.

3. In two of the experiments the same fact was observed: that in laying down a new ley on an alp after breaking up the old turf, the grass seeds that were sown did not sprout unless they were abundantly manured with farmyard manure or chemicals. After broadcasting, the grasses did not develop sufficiently to form the new turf till three and four years, according to the altitude. The vegetation obtained at last was poor and was composed chiefly of weeds, *Aira* and *Nardus stricta*.

4. With one single manuring of farmyard manure (St) or chemicals alone (K), or of a mixture of both (K + St) the average crop of hay was the following during the first five years, in cwt. per acre.

Manures	1908	1909	1910	1911	1912
Unmanured	7.71	8.76	14.01	19.59	12.22
St	17.44	20.72	19.20	20.89	14.19
K	18.56	14.30	19.75	27.92	17.43
K + St.	23.34	23.97	21.33	28.11	16.93

The crops from the unmanured plots are light on account of the impoverished state of the soil. Reckoning them at 100 the increases due to the manures are given below.

Year	Stable manure	Chemical manures	Stable and chemical manure
1908	2 to 2 $^{1}/_{3}$ times as much	2 $^{1}/_{4}$ to 2 $^{1}/_{2}$ times as much	fully 3 times as much
1909	»	100 : 150 to 160	2 $^{3}/_{4}$ times as much
1910	100 : 137	100 : 142	100 : 152
1911	100 : 106	100 : 142	100 : 143
1912	100 : 116	100 : 142	100 : 138

In some cases the writer observed extraordinary increases of the crop, as much as 4 to 7 times the amount from the unmanured plots. The results of the various years confirm each other satisfactorily.

The effect of the stable manure during the first and third years was equal to that of the chemicals, and in the second year even better, but in the fourth and fifth years it was considerably inferior and barely noticeable. The combination of stable and chemical manures had the best results and during the first three years was superior to that of the other manures applied separately; in the two last years however it was of equal value to the artificials. The considerably longer duration of the after effects of artificials as compared with farmyard manure is proved beyond all doubt. The after effects of stable manure lasted about three years, those of artificials about five. Only after this period did the increase of crop due to artificials cease to be noticed on some of the alps.

For the practical Alpine farmer—as in general for all farmers—the combination of farmyard and chemical manures is advisable.

5. Respecting the water content of green forage and the ratio between hay and the dry substance in hay the writer noticed variations ranging from 17.3 to 60.4 per cent. of hay in the green forage, while the hay contained from 80.3 to 90.1 per cent. of dry matter. The plots that gave the lowest yield, thus the unmanured and the St. plots, gave the driest green forage, the heavier bearing plots (K and K + St) the richest in water, there being a sort of compensation in the higher hay and dry substance content of the smaller crop. On the other hand the quality of the dry straw-like grass of the poorer plots is naturally inferior to that of the juicy forage of the good Alpine meadows, which is always richer in protein. In general it may be said, with the increasing yield of a plot the water content of the grass crop increases and this may be explained by the fact that the drying action of the sun is not so powerful on a dense vegetation as on a thin and scanty one.

Level Alpine meadows bear much more abundantly than those situated on slopes, which is to a certain extent due to the lesser leaching out of plant food from the humus and washing away of the fine earth and to the circumstance that the slopes in some aspects, are exposed to a more intense action of the sun.

The writer mentions another observation made elsewhere: the analysis of three samples of grass which was cut on August 22, 1912, near Mallnitz at different altitudes above sea level:

Height above sea level . . .	7 710 ft.	6 725 ft	5 905 ft
	per cent	per cent	per cent
Crude protein	17.90	15.90	12.90
Crude fat	2.62	2 64	1.84
Ash	8.34	6.62	9.58

From the above it would appear that the protein content increases with increase of altitude; this question is sufficiently interesting to deserve to be more closely studied and on more ample material.

6. The sowing of good forage grasses and clovers on Alpine meadows is a measure strongly to be recommended. In the above-mentioned experiments timothy and dog's-tail proved to be the best grasses; they are of slow but good growth both on limestone and on primary rocks. Fox-tail, yellow oats and alsike clover grew luxuriantly the first year after sowing, but then their growth slackened and they even disappeared completely. In order to prevent this disappearance it is necessary, after the first initial manuring, to repeat every year the application of animal and mineral fertilizers, for already after four or five years, areas which presented a quite different botanical population, lose the best sorts of grasses, get invaded by weeds and end by being covered with the same plants, generally of a poor description.

7. The use on the alps of the best possible artificials, notwithstanding the high cost of transport, which by suitable measures may be much reduced, is in the end the most profitable course to pursue, owing to the great increase of crops which they cause and to the length of time over which their after effects extend.

1146 - ***Desmodium hirtum*, Leguminous Forage Plant Recommended for the Prevention of the Development of Weeds and as Green Manure for Tropical Plants.** — STOLZ, A. and HARMS, H. in *Der Tropenpflanzer*, Year 17, No. 8, pp. 430-437. Berlin, August 1913.

This plant is an addition to the number of nitrogen-bringing green manure plants, which grow rapidly forming a dense cover, capable of preventing the development of weeds and of protecting the soil against leaching out by torrential rains and the heat of the tropical sun.

The habitat of *Desmodium hirtum* (Guill. et Perr.) is fairly extensive. It is found in Natal. German East Africa, Senegambia, Sierra Leone, Togo and Kamerum. It grows from sea level up to an elevation of about 5 600 feet. It is a herbaceous climbing plant, the branches attaining a length of 3ft.

to 6 ft. In German East Africa the plant loses its leaves in July and and August and many of the branches die, but in September vegetation starts again, new branches cover those that have died and which go to form an excellent humus.

The production of the seeds is not very easy, consequently the writers recommend the following method. The seeds are sown in a rich, loose, fresh soil; the seedlings are transplanted when about 4 inches high into loose soil. Thus vigorous plants are obtained which produce numerous cuttings. The writers insist on the necessity of taking only rooted cuttings, and they advise choosing a rainy season for making a plantation and setting the plants 3ft. apart.

This *Desmodium* is very sensible to the physical state of the soil; it has a decided preference for tilled soils and develops much more in plantations than in the wild state.

In a rich soil this leguminous plant forms a cover one foot deep which completely prevents the growth of weeds and thus allows a great economy of hoeing; besides this, *Desmodium* may be utilized as green manure and as food for live stock, sheep and asses being especially fond of it.

1147 - **Cotton Problems in Louisiana.** — Cook, O. F. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 130, pp. 3-14. Washington, June 21, 1913.

FIBRE CROPS

The production of cotton in Louisiana is at present traversing a crisis of which the chief causes are the following:

1. — The higher cost of farm labour and the difficulty of finding sufficient hands for picking due to the double exodus to the cities and towns and to Texas.

2. — The boll weevil finds here specially favourable conditions: the presence of late maturing varieties of cotton, the great luxuriance of vegetative development, the great extent of wooded country, affording unusual facilities for the hibernation of the insect.

3. — The tendency of the cotton industry to replace the long stapled cottons by short staples is injurious to the lower Mississippi Valley (Louisiana and Mississippi) which produces the best Upland long-staple of all the cotton belt.

4. — The introduction of large public gins instead of the old separate plantation gins had led:

a) to a mixture of seeds rendering it difficult to secure supplies of good seed;

b) to a mixture of various cottons injurious to the quality of the fibre and causing complaints on the part of the buyers.

The writer studies the means of improving this state of things.

1. — Control of the boll weevil: *a*) promoting scientific research with the object of obtaining long-staple *early* varieties and testing the methods of cultivation calculated to increase this quality (root-pruning, closer planting, topping, etc); *b*) organizing communites of planters for the *collective* con-

trol of the insect, which is the only efficient means of obtaining practical results.

2.— *Improvement of the quality* cf the produce by means of these groups of planters, who should rigorously select their seed and strive for a *uniform* product.

3.— *Education of the consumer.* The improvements of spinning machinery have made it possible to spin short cotton and produce fabrics closely similar to those previously made from long staples. But the short-staple fabrics are undoubtedly inferior in strength and durability to the long-staple ones. As this change is against the interests of the consumer as well as of the planter of long-staple cottons, and profitable only to the spinner, the public should be illuminated on the subject.

4. Lastly the writer proposes the acclimatization into Louisiana of other tropical crops, so that cotton may become a branch of a saner and more diversified system of agriculture, which would be especially advantageous for the better utilization of labour.

1148 - **Cotton in India.** — SCHANTZ, MAURICE in *Beihefte zum Tropenpflanzer*, Vol. XIV, No. 5-6, pp. 439-609. Berlin, August 1913.

This article supplements the monographs already published on Cotton Cultivation in the United States and Egypt.

Historical. — The author outlines the history of cotton cultivation from 800 B. C. Table I shows the effect of the War of Secession in 1861-1865 on the production of Indian cotton.

TABLE I.

Year	Exports	
	Quantity	Value
	tons	millions sterling
1860	170 300	7.3
1861	176 400	10 0
1862	211 100	18.5
1863	245 600	35.1
1864	234 400	36.8
1865	358 350	34.9
1866	189 950	16.2
1867	274 150	19.7
1871	361 250	20.9
1878	148 300	7.7

Many attempts have been made to improve the quality of this fibre and the results are now being felt. In particular the author mentions the work of the Cotton Supply Association, the British Cotton Growing Association, the International Federation of Master Cotton Spinners' and Manufacturers' Associations, and the Indian Government.

Soils — In India the three great cotton areas correspond to three great geological formations. 1) The northern zone comprising the alluvial soils of the Bundelkand and the valleys of the Indus and Ganges, which vary from the sands of Sind and the Punjab to the clays of the United Provinces. 2). The midde zone extending from Rajputana to the Dekkan consists of the famous " Regar " or Black Cotton Soil, the richest soil in India. 3) The Southern zone consists of a soil of crystalline origin and comprising the ferruginous, red and yellow lands. The " Regar " soil is also found in this zone, particularly in the districts of Tinnevelly and Coimbatore.

Climate. — Owing to the monsoons, India receives 90 per cent. of its rainfall during the summer or south-west monsoon. The distribution of the rainfall is very irregular, causing thereby the proverbial famines of dry years; the mean annual rainfall varies from 23 cm. to 358 cm. in the various provinces. When there is not enough rain the cotton has to be irrigated. The Government has been much concerned with this question and has restored the old canals and constructed new ones, so that in March 1912 the total length of these canals reached 58 000 miles.

Geographical Distribution. — Cotton is cultivated to some extent throughout India. In Berar one-third of the cultivated lands is given up to this crop, in Bombay 10 per cent., in Madras 5 ½ per cent., Central Provinces 4 ½ per cent., North-West Provinces 4 per cent. Sind 3 ½ per cent., and in the Punjab 2 ½ per cent. This shows the relative importance of this crop in each province, while the following figures show the distribution of the cotton areas in the different provinces.

Provinces	per cent.
Bombay	28
Central Provinces and Berar	22.5
Haiderabad	13.9
Madras	8.4
Punjab	8
United Provinces	6.2
Central Provinces	4.4
Baroda	3.1
Rajputana	2.1
Other provinces	3.4
	100

Species cultivated in India. — The writer has divided the different indigenous varieties into three groups: *Gossypium arboreum*, *G. nanking*, and *G. obtusifolium*. The exotic varieties which have been introduced with more or less success are divided into two groups according to the appearance of the seed, thus: *a*) with covered seeds - *Gossypium hirsutum* (Upland); *b*) with naked seeds - *G. purpurescens*, *G. vitifolium* and *G. brasiliense*.

Commercial varieties. — Table III gives a résumé of the characters of Indian cottons.

TABLE III.

Name	Colour and appearance	Length mm.	Diameter mm.
Oomras	white-cream, silky	—	—
Khandesh	dirty	10–16	$^1/_{50} - ^1/_{75}$
Berar type	clean	10–25	$^1/_{50} - ^1/_{75}$
Berar special good staple	clean	20–30	$^1/_{50} - ^1/_{75}$
Dholleras	white, silky	15–25	$^1/_{40} - ^1/_{100}$
Broach	white, silky, clean	16–26	$^1/_{50} - ^1/_{75}$
Broach Surtee	veny beatiful white, silky	20–30	$^1/_{50} - ^1/_{75}$
Bengal	white mixed with yellow flocks	13–16	$^1/_{30} - ^1/_{60}$
Sind	clean, yellowish white	13–16	$^1/_{40} - ^1/_{75}$
Punjab	white, half silky	17–22	$^1/_{40} - ^1/_{75}$
Assam	white, very clean and short.	10–13	$^1/_{20} - ^1/_{65}$
Burma	white to khaki.	13–16	$^1/_{40} - ^1/_{75}$
Kumptas	yellowish brown, silky	19–22	$^1/_{30} - ^1/_{65}$
Dharwar American	beatiful white, silky	16–20	$^1/_{40} - ^1/_{75}$
Westerns	white to yellow, very dirty	20–24	$^1/_{60} - ^1/_{90}$
Northerns	deep yellow to red.	20–24	$^1/_{40} - ^1/_{70}$
Cocanadas	reddish brown to white	20–24	$^1/_{40} - ^1/_{60}$
Tinnevelly	white to cream, strong, silky	23	$^1/_{30} - ^1/_{70}$

From the point of view of quantity, Oomras are the most important, representing almost half the production of India. The best quality cotton is the Broach, followed by Dharwars; Sindhs and Punjabis resemble the Bengal varieties which constitute the lower grades; whilst the Oomras are of average quality.

Area under cotton and yield. — The areas and yields of the various Provinces are given in Table IV.

TABLE IV.

Province	Area under cotton in thousands of acres	Yield in thousands of bales (400 lbs.)
Bombay	5 932	1 302
Central Provinces and Berar	4 523	910
Madras	2 426	317
Punjab	1 575	346
United Provinces	1 148	425
Sindh	288	121
Burma	227	45
Bengal	89	19
Assam and Eastern Bengal	86	31
N. W. Provinces	55	13
Ajmir and Marwar	51	20
Haiderabad	2 888	300
Central Provinces	1 314	206
Baroda	762	196
Rajputana	393	127
Mysore	154	19

Whilst the yield per acre for the United States is 175 to 215 lbs. and that of Egpyt 340, it is only 100 for India.

The yield varies considerably from the South to the North, where it is greatest. Table IV shows this variation and the effect of irrigation.

Yield of lint. — The quantity of lint amounts to about one-third of the weight of the crop : this proportion varies from about 25 per cent for Rozzi to about 41 per cent for Comilla.

TABLE V. — *Yield of cotton in lbs. per acre*

Province	With irrigation	Without irrigation
Sindh	308	—
Ajmir and Marwar	—	192
Berar	—	144
United Provinces	190	130
Bombay	—	100
Punjab	109	80
Upper Burma	—	80
North-West Provinces	183	72
Bengal	—	75
Central Provinces	—	75
Mysore	—	52
Madras	—	45

Seeds. — The ratio by weight of the seeds to the fibre is about 7 to 3. Apart from their use for sowing they are largely used for feeding cattle on the spot (4 to 5 lbs. a day). The exports from Bombay for feeding are increasing each year.

Year	Exports of Cotton Seed
1897–98	28 360 cwt.
1900–01	225 000 »
1910	6 000 000 »

Cultivation — The cotton plantations are not in the hands of European planters, the crop being grown by the inhabitants. Sindh and Madras are the only Provinces in which the perennial species are still grown. The seeds, often mixed with other grains, are generally sown broadcast in the Central and United Provinces, Berar and the Punjab.

A rotation is practised consisting of wheat, millet, oleaginous and leguminous plants. About 10 lbs. of seed is sown per acre. Sowing is most usual in June, but there is probably not a month in the year in which sowing does not take place in some part of India. The growing period is similarly variable. The Oomra variety matures in 4 or 5 months, whilst Surtee Broach requires 8 months. The first picking generally gives the best quality and the second the greatest quantity, whilst the third is inferior in both quality and quantity.

There is not the same uniformity in production of cotton in India that there is in Egypt and the United States, so that the writer studies the different districts in detail.

Principal Cotton Centres.

1. *Punjab.* — The soil is generally alluvial or sandy, and owing to the mean rainfall of 600 mm. (150 to 180 mm in the West) the cotton crop requires irrigation. The canals are well developed and irrigate about seven million acres. The Chenab canal, the greatest in India, has transformep what was 70 years ago an arid desert near Lyallpur, into a fertile region. Half of this land is held by small owners (with 4 to 6 acres) who apply the principles of modern agriculture, and the yield is considerably greater in this district than in most of the regions of India.

2. *Bombay Presidency.* — *a*) *Sindh.* — This district resembles Egypt in being a desert traversed by a river and a fertile valley. The mean rainfall being only 180 mm., irrigation is indispensable; cotton is limited to the districts of Haiderabad, Thar and Parkar, where irrigation is possible.

The inhabitants cultivate only a third or even a fifth of their land, the Government allowing the land to be fallow for 5 years.

On the hill lands the Sailabi method is practised: first irrigation, then sowing followed by frequent irrigations, because the soil does not retain the water. The Bosi method is applied to the inundated area which is not irrigated after the sowing.

Since 1852, numerous experiments have been made to introduce varieties having a longer staple, but disease and atmospheric conditions have been unfavourable to their success. The experiments have shown that when the irrigation canals are finished, it will be possible to cultivate varieties of cotton such as Mitafifi, which, with careful harvesting and preparation, will equal the "fully good fair brown ,, Egyptian. This would yield a profit of 60 rupees (80*s*) per acre in place of the 42 (57*s*) which is obtained in the Sindh under the same conditions. It is also hoped that similar success will be obtained with the Upland, which required only 12 to 13 irrigations in place of 22 required by Mitafifi.

b) *Gujerat North* or *Kaira-Ahmedabad.* — A sandy soil with a rainfall of 700 to 950 mm. produces a yield of raw cotton (variety Dholera) of 200 lbs. per acre without irrigation, and up to 1200 lbs. with irrigation. Most of this crop goes to the spinning mills of Ahmedabad.

c) *Gujerat South* — The famous variety Surtee Broach originated here. It is the best native variety, but Surat Deschi Broach is the most cultivated. The soil is a black clay, only tillable after the rains, which amount to 850 or 1150 mm. per annum. Irrigation is not practised; the people are intelligent and the system of cultivation is the best in India.

d) *Deccan of Bombay.* — This supplies most of the Bombay requirements. It has a clay soil and a mean rainfall of 700 mm. Cotton is the ehicf product of the North and the variety Oomras is mostly grown.

e) *Mahratta South* or *Karmatak.* — This region comprises the southern portion of the Bombay Presidency. About 600 000 acres are given up to cotton and two varieties are cultivated: 1) Kumptas, giving 300 to 400 lbs. of raw cotton with a yield of 25 to 29 per cent. of lint, is a variety of Broach and there s a tendency to substitute for it the true Broach which yields 100 lbs. p. acre, containing 34 per cent. of lint, with a market value

12 per cent. higher; 2) American Dharwar; this variety has degenerated and is being replaced by Cambodian.

3. *United Provinces.*—The western portion (Agra), which is well watered all the year, is the most important for cotton. About one-third is irrigated and the remainder receives an annual rainfall of only 820 mm. Some of the land is held by small owners in plots of 5 to 10 acres. The variety cultivated is Bengalee. Attempts to introduce varieties of long staple have been unsuccessful.

4. *Central Provinces and Berar.* — This is the centre of the cotton cultivation of India, and cotton here ranks second in importance in the textile trade. Three principal varieties are cultivated: *a*) Bani, one of the most beautiful cottons of India with a length of staple from 25 to 28 mm., and can be spun up to No. 40; it is being abandoned, an account of its low yield of lint (26 to 27 per cent) in favour of the more productive Jari. *b*) Berar Jari; this variety yields 35 per cent of lint, is very popular in the market on account of its wooly appearance, and is used in the manufacture of "Vicuna" cloth. It is a mixture of about 65 different varieties, amongst which are *G. malvensis*, *G. vera*, *G. rosea*, *G. rosea cutchia* and Bani. *c*) Buri: a Georgia-Upland variety obtained at Calcutta and the most hopeful of all the exotic varieties tried.

The most important cotton region is the valley of Payanghat, where the best product is obtained and 40 per cent. of the arable land is reserved for this crop. The rainfall varies from 750 to 1250 mm., and it is generally not necessary to irrigate. The methods of cultivation are quite primitive; cracking of the clay soil during the dry season takes the place of cultivation. Sowing takes place in June and the crop is harvested in October, as from November onwards the drought induces tearing of the roots.

5. *Madras Presidency.*— The annual rainfall is 700 to 760 mm. for Tinnevelly, 630 mm. for Coimbatore and 480 to 540 for Bellary; this is not always adequate and requires to be augmented by irrigation. The varieties cultivated are: *a*) Uppams, sown in May and July on the black cotton soil; they consist of about 8 different varieties, and are grown chiefly in the North of Tinnevelly and the south of Madoura. *b*) Nadam or Ladam, a perennial variety sown in September and November in red sandy soils; produces the cotton known as "cocanadas". *c*) Tellapatti (Uppam × Bourbon) yields Westerns (Bellary and Karnul) and Northerns (Tadpatri). *d*) Salems, a mixture of Uppams, Ladams, and Bourbon, met with in East Coimbatore. *e*) Cambodian has made rapid progress:

Years	1908	1909	1910	1911	1912
bales of 500 lbs.	40	1 650	7 500	30 000	80 000

On land manured and irrigated it gives 1250 to 1600 lbs. of raw cotton per acre, with a yield of 33 to 35 per cent. of lint; whilst the native varieties give 60 to 100 lbs. of lint, Cambodian reaches 500 and more, and the produce fetches 1*d* a lb. more.

Exports. — Cotton is an importamt factor in Indian commerce. In 1911-12 its export reached the value of 406 million rupees (27 millions sterling) made up as follows.

	Value in thousands of rupees.
Raw Cotton	293 341
Seed	15 191
Thread	75 901
Goods in bales	19 666
Shawls and handkerchiefs	1 525
Various	695
	406 319

The article concludes with a study of the cotton trade and industry of the Indian Empire.

1149 - **The Kapok Industry.** — SALEEBY, MURAD M. *The Government of the Philippine Islands, Department of Public Instruction, Bureau of Agriculture, Bulletin* No. 21, pp. 41 + plates VIII. Manila, 1913.

The Bulletin is written to supply the steadily increasing demand for reliable information concerning the culture of kapok. It is based on experiences in Java and the Philippines.

The kapok tree is extensively cultivated in the East Indies, Tropical India, Ceylon, Java and the Philippines. There are some eight species of *Ceiba* known in Tropical America, but their product is inferior to that of the true kapok, *Ceiba pentandra* Gaertn. (= *Eriodendron anfractuosum* DC.). It is sometimes confused with the species of the allied genus *Bombax*, of which there are 40 or 50 species all yielding floss of an inferior nature. They can be distinguished by their much greater size (the true kapok seldom exceeds 40 feet) and their much larger red flowers, 3 to 4 in. in length.

Seed selection. — The majority of the trees in the Philippines are propagated by cuttings. Some are raised from seed without the slightest regard for the selection of good seed of desirable parentage, and this accounts for the lack of uniformity in size, number and development of pods. Seed should be selected from trees more than 5 years old, of rapid growth, early and uniform fruiting habits and which are heavy yielders.

The following table shows the wide variation in the characters of the pods.

Climate. — Successful cultivation can only be accomplished in the tropics, and the best results are obtained at an altitude below 1,500 feet. It can withstand comparatively long periods of drought and from the first appearance of the flowers until the pods have been harvested a period of drought is essential. Continuous showers of rain during this period, especially the latter part of it, often seriously interfere with the development of the pods and damage the floss. Strong winds, particularly typhoons, cause setious damage to the long heavy horizontal branches and often uproot the trees.

Length of pod	Total weight of pod	Weight of floss	Number of seeds
mm.	gms.	gms.	
152	39.5	7.0	166
137	33.5	5.9	184
129	30.0	5.0	149
113	27.0	4.9	109
100	24.7	4.7	183
101	17.5	3.0	71

Cultivation. — This tree flourishes in a wide range of soils, but the best results are obtained from a well-weathered volcanic soil. Inferior soils are generally considered unsuitable for planting on a large scale, and owing to the somewhat low returns from kapok it does not justify itself on a rich soil unless grown as a subsidiary crop.

Cuttings should not be of the same season's growth; they should be of one half to 2 metres (18 in. to 6 ft. 6 in.) in length. They are planted about 50 cm. (20 in.) deep at the beginning of the wet season. Trees grown from cuttings generally yield a crop 6 to 12 months earlier than those from seed, but seed propagation has distinct advantages in healthier trees, more productive and resistant to wind and pests. Seeds are sown at the beginning of the wet season in hills 15 cm. (6 in.) apart. Until the seedlings have attained a height of 12 to 15 cm. (5 to 6 in.) they require shade protection. They are ready for transplantation at the age of 10 to 12 months. Before transplanting, all the leaves should be removed and the stem cut back to a height of 50 cm. (20 in.). The trees should be planted in straight rows 6 or 6 ½ metres (20 or 22 ft.) each way. No cultivation is required when established, unless some intermediate crop is grown. As secondary crops the following are recommended: Maguey, sisal, henequen, Mauritius hemp.

Harvesting. — The first crop is obtained between the third and fourth year; normal crops are borne in the sixth and seventh years, with an increasing yield up to the thirtieth year. Harvest must be completed in June before the wet season. The pods are harvested when light brown and wrinkled. Unripe pods yield floss lacking in lustre and liable to fermentation, while over-ripe ones yield a dull floss lacking in elasticity. The floss must be sorted, graded, and cleaned. Hand cleaning is very tedious and is now superseded by specially constructed machinery.

Marketing. — It is generally sold under two classes, cleaned and uncleaned. Each class is further subdivided into grades thus:

A. Cleaned: 1) extra; 2) good (prime Java), or first quality; 3) second quality; 4) damaged.

B. Uncleaned: 1) good, or first quality; 2) ordinary or fair quality; 3) damaged.

The bales are made of about 10 cubic feet capacity and weighing between 80 and 100 lbs. To effect this, a pressure of 80 000 lbs. is required.

Production. — Java and the Philippines are the chief countries exporting kapok, and the amount exported is but a small fraction of the quantity produced.

Years	Total exported in tons	
	from Java	from the Philippines
1903	4 400	—
1904	4 675	—
1905	6 300	4
1906	5 875	13 ½
1907	8 250	37
1908	6 900	27
1909	8 000	10
1910	7 930	30
1911	9 906	98
1912	10 235	31 ½

The exports from British India and Ceylon amounted to 200 tons in 1870 and this amount has not increased since; the product is decidely inferior to that from Java.

Yield. — From average trees of normal growth under seven years of age the yield is estimated at 350 to 400 pods. Trees from seven to ten years should yield 600 pods or more.In some cases 150 pods yield 1 kilo (2.2 lbs.) of floss, but the average is more nearly 230 pods per kilo. Thus 1 hectare of land containing 280 trees should yield about 100 000 pods, producing 450 kilos of clean kapok per year. In the tenth year this would be increased to 640 kilos. The yield of seed is double that of the floss.

By-products. — The seed is roasted for food by the natives of India in times of famine. The Chinese and Javanese extract an oil from the seed, which is used for soap making and adulterating other oils, whilst the residue is used as a manure or as cattle feed. Analysis shows that the seed contains about 2 per cent. of oil.

The trunk is used for telegraph poles and as a support for pepper plants. Its wood, which is light and soft, is used for tanning leather and other minor purposes. It also yields a dark red opaque gum which has medicinal value. The bark contains a reddish fibre sometimes used for tying purposes.

Enemies and Diseases. — It has few serious enemies. *Dysdercus cingulatus* Fabr. attacks the pods, and a species of *Helopeltis* attacks the leaves. The worst enemies are bats and monkeys. No fungus or bacterial disease has yet been reported as attacking the kapok tree.

1150 - **The Cultivation of Sisal Hemp in German East Africa** (1). — BRUCK, WERNER FRIEDERICH in *Arbeiten der Deutschen Landwirtschafts Gesellschaft*, No. 244, 70 pp. Berlin, 1913.

Historical. — In the agricultural annals of the German colonies there is perhaps no example of so rapid a development as that of sisal. In 1893 Hindorf, on behalf of the German East Africa Company, bought in Florida 1000 sisal plants which were sent to the Kikogwe plantation near the mouth of the Pangani ; of this number only 62 took, and this is the origin of sisal cultivation in German East Africa which in 1912 occupied 52750 acres.

Extent. — In this colony sisal is cultivated : 1. In the North along the Tanga-Moschi and Korogne railways at the mouth of the Pagani. 2. From Dar-es-salam to Kilossa. 3. In the South in the Lindi Mikindani region near the mouth of the Rowuma.

After ceara, sisal is the most important industrial crop of this region.

	Area		Value of Exports
	Planted	Bearing	
	acres	acres	£
Ceara	80 724	28 469	233 134
Sisal	52 697	28 067	221 002

Progression of the Exports of Sisal.

1901	15 tons
1905	1 400 »
1910	7 000 »
1911	10 000 »
1912	16 000 »

Varieties. — An unsuccessful attempt was made to introduce white sisal from Yucatan : *Agave Fourcroydes* (Lemaire) or *A. elongata* or *A. rigida* var. *elongata.* At present the only variety grown comes from Florida (cf. Historical); it is the same as " Henequen verde " of the Spaniards or " grüner Sisal " of the Germans; its botanical names are *Agave Sisalana* Perrine or *A. rigida* var. *Sisalana.*

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(1) For conditions of soil, cultivation etc. see also a report of a journey of instruction by Hr. Bruck in No. 250, *B.* March 1913. (*Ed.*).

Climate. — In German East Africa, sisal can be cultivated up to 1480 feet above sea level, but the best results are obtained below 660 ft. The amount of rainfall may vary from 39 to 48 inches, and it may even sink to 31 inches if the moist and dry seasons are sharply separated.

Position of German East Africa in the world's market of Agave fibre.

Henequen (Yucatan sisal)	136 766 tons
Sisal (Green sisal):	
German East Africa	15 700 »
Java	3 900 »
Bahamas	3 100 »
Hawai	492 »
Papuasia	295 »

1151 - **Elaeis Fruits without Stones.** — GATIN, C. L. in *Journal d'Agriculture tropicale*, Year 13, No 145, pp. 205-208. Paris, July 1913.

OIL CROPS

All seedless fruits are called *parthenocarpic* and the phenomenon which results in the production of fruits without seeds is known as *parthenocarpy*.

Parthenocarpy is said to be *vegetative* when the pollen does not come into contact with the pistil; and *stimulative* when the pollen coming into contact with the stigma does not cause fecundation but only a slight stimulus.

Varieties of Elaeis nigrescens.

Varieties		*communis* (A. Chev.)		*pisifera* (A. Chev.)	*Ceredia* (A. Chev.)
		typical form	form with thin shell		
normal fruits	1) oily pulp, proportion by weight . . .	48 %	66 %	84 %	85 %
	2) stones . . .	large thick shell	tendency to grow smaller	small, shell very thin, sometimes absent	small, thin shell
abnormal fruits	1) proportion by number . . .	*1/10*	*1/10*	rare	*2/3*
	2) characters. .	small, pulp: not very oily: very hard stone	oily pulp: tender stones		almost as large as the normal fruit, pulp oily

The parthenocarpic fruits of *Elaeis* seem to belong to this latter case; a closer knowledge of their production would be of great interest from the point of view of the study of the biological conditions attending upon the production of varieties.

The subspecies *Elaeis virescens* will not be considered, not being of interest from a cultural point of view.

The table on the preceding page shows the difference between the several varieties of *Elaeis nigrescens*.

This table shows two points upon which selection should bear.

1) *Normal fruits*. The *pisifera* variety is particularly interesting for the reduction of its stones.

2) *Abnormal fruits*. A special position must be accorded to the *Ceredia* variety, which shows a considerable proportion of fruits without stones.

RUBBER, GUM AND RESIN PLANTS

1152 - **Contribution to the Study of the Castor-oil Plant.** — RIGOTARD, L. in *L'Agronomie Coloniale*, Year 1, No. 1, pp. 15 to 21. Paris, July 1913.

The writer gives some data as to the yield in oil of castor-oil seeds from French West Africa.

Guinea: Brown mottled seeds; oil from the whole seed 42.50 to 46.02 per cent.

Ivory Coast: Brown mottled seeds; stems brown or red. Oil: 43.36 to 46.20 per cent.

Upper Senegal, Niger.—Several varieties (blood-coloured castor, green, Brazil, Zanzibar, etc.): 41.7 to 54.6 per cent. This latter figure, which corresponds to 64.77 per cent. of oil in the kernel, has been obtained from seeds that came from Brazil and were cultivated in French West Africa. As term of comparison it is stated that Indian castor gave an average of about 47 per cent.

1153 - **Plantation Rubber in Hawaii.** — ANDERSON, W. A. in *Hawaii Agricultural Experiment Station, Press Bulletin*, No. 44, pp. 1-12. Honolulu, July 1, 1913.

This Bulletin contains the last results obtained in the Naliku plantation.

1. *Distance*. — It is more advantageous to plant closely and subsequently thin out until those that remain are 20 by 20 feet apart, than to plant the trees at once at this distance. The chief advantage of the system is that it allows selection by means of thinning. The disadvantage of less uniformity of the stand due to selection will be amply compensated by the increase of yield during the first years (owing to the greater number of trees).

2. *Multiplication*. — In order to make a new plantation the best way is to use selected cuttings taken from the best yielding trees.

3. *Cultivation*. — The control of weeds by means of hoeing is too costly and causes loss by erosion; the most practical method was found in the arsenite of soda spray, provided it be not allowed to touch the stems of Ceara trees under two years of age or of Hevea trees at all. The aeration of the soil by means of dynamite costs only 15 to 20 dollars an acre, and does not cause much erosion.

4. *Tapping.* — Up to now the best way of tapping Ceara consists in removing the outer bark in narrow vertical strips and tapping these strips by incision, allowing the latex to coagulate on the ground. It is hoped that a good type of container will soon be found.

5. *Curing* — This operation has a very great influence on the quality of the product. Drying in the air at ordinary temperature has not given a uniformly good product; it should be completed by the vacuum dryer at artificial temperatures not greater than 120° F.

6. *Value.* — When it is properly prepared, Hawaii Ceara commands prices not much inferior to those of Ceylon plantation, namely about 5 to 10 per cent. less.

1154 - **Experiments in Manuring on a Tea Estate in Darjeeling.** — BALD, C. in *The Agricultural Journal of India,* Vol. VIII, Part. II, pp. 157-160. Calcutta, April 1913.

VARIOUS CROPS

The plan of the experiments was as follows:

No. of plot (each measuring half an acre)	Manure applied		
	1909	1910	1911
1	Castor meal, 14 maunds per acre	Castor meal, 4 maunds per acre.	id.
		Nitrate of potash, 40 lbs. per acre.	id.
		Superphosphate, 120 lbs. per acre.	Superphosphate, 60 lbs. per acre.
			Sulphate of ammonia, 120 lbs. per acre.
2	Mature leaves of *Cajanus indicus.*	id.	id.
3	Castor meal, 7½ maunds per acre	Nitrate of potash, 40 lbs. per acre. Superphosphate, 120 lbs. per acre.	Animal meal, 2 maunds per acre.
4	Nothing (check plot).	Nothing (check plot).	Nothing (check plot).

The block of land which was selected for these experiments was as nearly equal in quality as it was possible to obtain, but the event proved that the quality of the check plot soil was the best.

A digest of the results for the three years in crop is as follows:

Tea per acre in	1909	1910	1911	Total
	lbs.	lbs.	lbs.	lbs.
Plot No. 1	247	265	345	857
» No. 2	239	313	324	876
» No. 3	258	270	312	840
» No 4	275	305	286	867

With a view to determining whether there was any difference in the quality of the teas produced under the different circumstances, samples of tea from all four plots were prepared and were valued on September 18, 1911. The valuations per lb. were 10½*d*, 11*d*, 9*d* and 1s respectively.

The cost of treatment works out as follows:

	1909			1910			1911			Total		
	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*	£	*s*	*d*
Plot No 1	4	5	4	2	4	6	2	19	6	9	9	4
» No. 2	—	6	1	—	6	1	—	6	1	—	18	3
» No. 3	2	2	8	1	1	10	1	1	2	4	5	8
» No. 4 check plot, no expenditure.												

The total crop from No. 4 is comparatively high. Apart from the question of the relative quality of the teas produced, the extra crop from No. 3 is not sufficient to pay for the treatment given it, while the cost of treatment to No. 1 is altogether prohibitive.

The valuation of the samples places No. 4, the untreated plot, much higher than any of the others, while the green-manured plot comes second and the plot treated with animal manure is given a very low place. The valuations, however, cannot be regarded as final.

Some of the outstanding facts in connection with these experiments are the high cost of chemical and artificial manures in a remote district like Darjeeling, the extreme doubtfulness of their economic utility, and above all the fact that green manuring is the cheapest method and at the same time produces remarkably satisfactory results.

1155 - **Cultural Experiments with Medicinal Plants at Korneuburg in 1912.** — MITLACHER, WILHELM. (Mitteilungen des Komitees zur staatlichen Forderung der Kultur von Arzeneipflanzen in Oesterreich, No. 15) in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 8, pp. 833-848. Vienna, August 1913.

A comprehensive report of the cultivation of medicinal plants in Austria in 1912. Detailed information respecting the sowing, development, management (in many cases manurial experiments), harvestings, yield, etc., of the following plants: hollyhock (*Althea rosea*), *Ancyclus officinarum*, *Angelica archangelica*, *Anthemis nobilis*, marigold (*Calendula officinalis*), *Cnicus benedictus*, hemlock (*Conium maculatum*), thorn-apple(*Datura Stramonium*), field poppy (*Papaver Rhoeas*), *Datura Tatula*, foxglove (*Digitalis purpurea*), *Gentiana lutea*, *Grindelia robusta*, *Hyosciamus agrestis*, henbane (*Hyosciamus niger*), *Hydrastis canadensis*, hyssop (*Hyssopus officinalis*), *Mentha crispa*, lavender (*Lavendula spica*), *Levisticum officinale*, *Mentha canadensis* var. *piperascens*, peppermint (*Mentha piperita*), rue (*Ruta graveolens*), sage (*Salvia officinalis*), *Spilanthes oleracea*, valerian (*Valeriana officinalis*), *Verbascum phlomoides*.

1156 - **Cultivation of Lavender in the South-East of France.**— ROLLAND, M. in *La Vie Agricole et rurale*, Year 2, No. 37, pp. 285-289. Paris, August 16, 1913.

Economic position of essence of lavender. — For the last twelve years the price of essence of lavender has more than doubled, and has kept during several seasons at about 10*s* 9*d* per pound. This rise seems to be due to the discovery of a process which allows the economic extraction from this essence of some compounds used in the manufacture of perfumery. On the other hand the yield of lavender plantations diminishes rapidly and the work of reafforestation carried out by the Forest Administration reduces considerably the areas on which wild lavender grew.

Species of lavender.—They are numerous in France. But as the most esteemed French lavenders are those gathered on the subalpine chains of the South-East, especially in the Departments of Drôme, Hautes-Alpes, Basses-Apes, Vaucluse and Alpes-Maritimes, the writer only mentions the types of lavenders which are found in that region and which are interesting from a cultural point of view. The essence of lavender proper is supplied by two forms of *Lavandula vera* DC.: *Lavandula vera fragrans*, Jord. and *Lavandula vera delphinensis*. These are the only two small species which deserve to be multiplied and they are found most frequently associated in their natural habitat. These two real lavenders are not found in the South-East at a height inferior to 1300 feet. Below this height they have yielded their place to common lavender: *Lavandula spica* Chaix or *latifolia* Vill. This lavender gives an essence of inferior quality, which is especially used in the preparation of varnishes and costs usually only from 2*s* 10*d* to 3*s* 7*d* per lb. In the belt where *Lavandula vera* and *L. spica* are neighbours, distillers have always found another species which they call "bastard lavender" and which yields a very inferior essence. M. Chatenier has recognized this bastard lavender to be a hybrid of *L. v. fragrans* and *L. v. delphinensis* with *L. spica*.

Essence of lavender. — The essence is especially concentrated in the flower, the peduncle containing only a very small quantity of it. In harvesting, however, this peduncle is cut at a length of about 4 to 6 inches, close to the first leaves. The composition of essence of lavender is complex. It owes its perfume to several bodies ; it contains also some compounds which diminish its value to a varying degree according to the origin and the amount of care bestowed upon the distillation. It is admitted that the fundamental element of the perfume is an ether of linalol, the acetate of linalyle $CH_3COO.C_{10}H_{18}$. The amount of this ether contained in the real essences of lavender produced in the South-East of France is in some localities 40 to 42 per cent., while it sinks to 22 per cent. in less favourable situations.

Influence of altitude, aspect and nature of the soil. — In the cultivated state the two real lavenders thrive and acquire enormous development even on the sea coast, as is proved by some tests. The essences from plants gathered well below 1300 feet have commanded the same prices as those prepared from natural lavenders growing at medium heights. Aspect seems to exert an influence on the quantity and quality of the essence produced, but its effect unites with that of altitude ; it remains to be observed in cultivations at lower elevations. As to soil, lavender seems not to be very exacting.

Creation of a lavender field. — M. Cornillac has planted a lavender field of 25 acres at about a mile from Valence. The soil is sandy with a good deal of stones and gravel; the subsoil, which begins at a depth of 16 to 32 inches, consists of big stones, gravel and building sand. The whole is a soil subject to drought and of a low value for farming. The land was ploughed to a depth of 16 inches and the lavender was planted, between November 15 and the end of February, in rows 46 inches apart, and the plants at 32 inches in the rows. These were transplanted from an altitude of 4000 feet: almost all of them struck, less than 1 per cent. failing. The field contains 105 000 plants, which cost delivered at the field 4*s* 4 ½ *d* per hundred. The men were paid 2*s* 9 *d* per day.

The cost of the whole field was :

	£	*s*	*d*
Ploughing	25	1	3
Purchase of plants	230	3	4
Compost and manure	11	17	11
Planting	41	2	4
Total . . . £	308	4	10

or £ 21 9*s* per acre.

It is especially to be noted that the young plants cut with the pruning scissors, shoot forth again easily and that for this result it is of the greatest importance to keep the field free from weeds during the first year.

Sometimes, in planting a new field, old stocks are used ; they are divided into pieces and planted, but their striking is uncertain. Young plants may also be obtained by sowing in a nursery. M. Cornillac has most successfully tried this method. The subsequent cultivation consists in hoeing two or three times. The first year the flowers that appear are suppressed so as not to exhaust the plants by allowing them to produce seed.

Lavender and truffle oaks. — The writer mentions several remarkable experiments on the growing of lavender in truffle producing oak plantations.

Regeneration of natural lavender fields. — Many landowners have commenced to regenerate their natural lavender fields by ploughing them in such a way as to leave only the plants in lines about 3ft. 3 in. apart.

Artificial manures. — Experiments hitherto made allow the conclusion to be drawn that the use of artificials increases the quantity of flowers; the yield in essence seems also to increase, and the quality of the perfume does not seem to be impaired.

Yield of a planted lavender field. — The writer, agreeing with M. Zacharewicz, states that an acre of lavender, planted in a favourable locality and manured with artificials, produces in ordinary years as follows :

1st year	Insignificant crop			
2nd »	1784 lbs. of flowers	yielding	12.5 lbs.	of essence
3rd »	3122 »	»	21.5 »	»
4th and following years	4460 »	»	31.2 »	»

Thus at the average price of 10*s* per lb. the gross returns of a lavender field after its fourth year would be about £ 15 10*s*. The cost of gathering is not more than 5 ½*d* per hundred pounds. The cost of distillation is about 5 ½ *d* per lb. of essence. The cost of hoeing and of manuring is about £ 1 12 *s* per acre. All the expenses together are within £ 3 12 *s*. Thus the net returns are about £ 12 per acre.

Diseases of lavender. — The two most important, dodder and rot, are not much to be feared.

1157 - **On an *Allium* from the Mediterranean Region which might be used as a Vegetable.** — TRABUT, L. in *Revue Horticole*, Year 85, No. 13, p 311, 1 fig. Paris, July 1, 1913.

MARKET GARDENING

Allium triquetrum L. is well known along the Algerian coast, especially in the neighbourhood of dwellings and in gardens, and is very much appreciated by the Berber population, who use it in large quantities during the winter. The culinary experiments of the writer have shown that the entire plant can be used to replace other vegetables in the winter months. Its leaves are very tender when cooked and of good flavour.

The writer has also experimented with the cultivation of this onion; he found it necessary to plant the bulbs towards the end of summer at a depth of from 15 to 20 cm. (6 to 8 in.) in order to obtain a good substitute for leeks. The bulbs planted separately and deeply in good soil produce large plants in the winter, the portion below ground being blanched, very tender and appetising. With the green leaves removed they constitute an excellent vegetable free from all smell of garlic or leek and compatible with any sauce. The writer has no hesitation is recommending this vegetable thus treated as a most interesting acquisition to gardens on the border of the Mediterranean.

FRUIT-GROWING

1158 - **The Sexual Organs of Vine Hybrids.** — GARD M. in *Comptes Rendus Hebdomadaires des Séanees de l'Académie des Sciences*, Vol. 157, No. 3, pp. 226-228. Paris, July 21, 1913.

I. In the cases of the male flowers (with long stamens) and the hermaphrodite flowers (with short recurved stamens), the pollen of the wild species is normal, the proportion of the empty grains not exceeding 10 to 12 per cent. In cultivated selected varieties, however, a larger degeneration was noticed, the empty grains amounting to 50 per cent. and upwards.

II. In the cultivated European vine two cases occur: 1) the pollen is often normal; 2) it consists of three kinds of grains: empty, normal and intermediate. According to the vine, sometimes the number of the two last are equal, sometimes one or other predominates, but the full grains are generally the most numerous.

In the wild varieties, as in the cultivated, the cases where the pollen is normal are more numerous than those where it is degenerate. We have no information as regards the causes of this degeneration.

III. The pollen of double hybrids is always modified, through to a varying degree, in the case of males, hermaphrodites with long stamens and hermaphrodites with short stamens. Often grains occur which are small, deformed, of abnormal appearance, not swelling in water, and with a very varied content resembling in optical section (like those of some cultivated vines) a cap, a crescent, or a crown.

In three-quarter, triple and quadruple hybrids there are also considerable differences according to the hybrid examined; the proportion of empty grains may be nearly normal or very great. The quantity of pollen can also present great variations.

The female organ, on the contrary, is as perfectly formed in hybrids as in species. The embryo-sac is never lacking in the ovules, and the pips are on the average more numerous than in the case of the parents.

IV. The pollen of short stamens, has, as is well known, very different morphological characters from that of the pollen of long stamens. From the cytological point of view, the writer has observed in the former a free generative cell and a vegtative nucleus similar to that occurring in the latter, while the deformed grains which are nearly or quite empty, in both cases lack a generative cell, or in any case the nucleus of the latter has degenerated.

Although not sterile as was supposed, the pollen of the short stamens is considered incapable of fertilizing the pistil of the same flower. The writer has proved the truth of this statement as regard *V. cordifolia*, Jacquez d'Aurelles, Blue Favourite, Massassoit and Black Eagle, while in the long-stamened flowers the pollen is fertile to the pistil of the same flower (1).

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(1) See No. 1430, *B.* Oct 1912. (*Ed.*).

V. The facts presented by the sexual organs of vine hybrids are thus not an exception to those already known, and do not agree with the statements of M. Couderc. The male elements are altered to a more or less considerable extent, while the female organs remain intact, according to the rule that ovules which occur in small numbers undergo no degeneration.

Mr. Booth has described two distinct forms of pollen, the one fertile and the other infertile, independently of the length and habit of the stamens, and which may occur together in certain American vines. They no doubt correspond to the normal and altered grains of hybrids and of some original vines. Their occurrence in the varieties studied by the writer is no surprising matter, seeing that the former are natural hybrids, though this fact is denied by a certain American school which is under the influence of Engelmann's ideas.

1159 – **The Reconstitution of Swiss Vineyards.** — FAES, H. in *Revue de Viticulture*, Year 20, Vol. XL, No. 1026, pp. 210-213. Paris, August 14, 1913.

In the spring of 1912, the Canton Vaud used in the reconstitution of its vineyards 1 371 250 meters (1) of "grafting wood", of which 194 150 m. were furnished by the Cantonal nurseries. The following were the varieties most in demand: Riparia × Rupestris 3 309 (625 300 m.), Riparia × Rupestris 101^{14} (300 400 m.), Riparia × Rupestris 3 306 (137 750 m.), Mourvèdre × Rupestris 1202 (99 500 m.), Berlandieri × Riparia 420 A (52 050 m.). The vintage of 1911, which was good on the whole, influenced the grafting of the spring of 1912 and gave rise to a greater demand of grafting wood (1 096 985 m. in the spring of 1911). A "grafting department" was carried on as usual at the Champs-de-l'Air Vine-growing Station.

In considering the vineyards in Switzerland which have been reconstituted on American stocks, it is possible, taking them as a whole, to arrive at certain conclusions; though these may not be final, they are sufficiently satisfactory to permit of the work of reconstitution being continued with a certain amount of security.

At the beginning of the reconstitution operations, Riparia Gloire de Montpellier and Rupestris were used amongst other "pure American stocks" for a certain number of vineyards. Subsequently, Americo × American and Franco × American stocks have been substituted for those first planted and now tend to entirely replace them.

In the Canton of Geneva, it is found that Riparia Gloire, when planted, in a good situation on deep, damp, slightly calcareous soil produces regular and good crops. It has, however, the defect of sometimes losing its vigour, even after four or five crops, if it is planted in less fertile, although deep soil. It is thought that the hybrids give better promise, especially as regards duration.

At Neuchâtel, Riparia Gloire has proved to be prolific and has grown into a fine plant on certain rich, deep soils poor in lime. But these special soils are very rare in the district, where most of the soil is dry and shallow ; Riparia, also, has never been a favourite in this Canton.

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(1) One meter = about 3 ft. 3 in. (*Ed.*).

In Ticino, Rupestris is being given up, as its wood ripens badly, especially in cold, wet seasons. It is also believed to have been observed that during severe winters, plants grafted on Rupestris suffer from frost more than do other vines. With regard to Riparia, the latter stock gave fair results in the southern part of the Canton, where the reconstitution work was begun on the best soils of the district. Disappointment, however, followed in the Lugano neighbourhood, where the soil of the vineyards is more stony. It is recorded that here also Riparia is abnormally productive at first, but soon perishes, all the more owing to the long pruning adopted in order to obtain a larger crop.

In the Canton Vaud certain soils have been found to be perfectly suitable to either Riparia or Rupestris. But in consequence of the short pruning practised in the Swiss vineyards, this latter stock tends frequently to promote the vegetative growth of its scion at the expense of the fruit, which causes the grapes to ripen late. Riparia Gloire has proved especially unsatisfactory on a heavy, cold type of soil, such as that often presented by glacial clays, irrespective of the amount of lime present.

Americo × American stocks, and especially Riparia × Rupestris, are being increasingly substituted for pure American stocks, owing to their greater powers of adaptation. Riparia × Rupestris 3 309, 101^{14}, 3 306 and 11-F form at the present time the basis of reconstitution in most of the Swiss vineyards with poor or average soil ; of these the two former are by far the most common. So far, the said stocks have given satisfaction in the majority of cases. Solonis × Riparia 1 616, a hybrid much in demand only a few years ago, is now out of favour, as it is considered, perhaps wrongly, to possess insufficient power of phylloxera resistance. In the Canton Vaud, for instance, Riparia × Rupestris 101^{14}, which has already been planted in numerous vineyards, is without doubt a stock suitable to many average, rather heavy, and even heavy soils. It should not be planted in very light dry soils, or in those wanting in depth, for it is easily affected by drought. It nearly always prefers somewhat heavy soils to very light ones. This vine must not be grown in tufaceous soil, or in calcareous marls, as its resistance to calcium carbonate is not sufficient to allow of its normal development in soils of this nature.

In the same district, Riparia × Rupestris 3 309 gives excellent results on a large variety of soils, and replaces the Lot variety on gravelly and light soils. The writer has often seen magnificent specimens of this vine, covered with fruit, growing on the gravelly soil of the Aigle district. On the other hand, 3 309 having been quite recently introduced into Switzerland, the plantations on this stock are, as a rule, younger than those grafted on 101^{14} When their progress has been followed for a few more years, it will be possible to decide authoritatively upon the type of soil best fitted for this vine, which is much in request now-a-days.

The Canton of Neuchâtel has proved especially suitable to Riparia × Rupestris 3 309.

In the Canton Ticino, Riparia × Rupestris 101^{14} has gained the favour of the vine grower. Its adaptability to vineyard soils of different compositions in that district is relatively great; its growth leaves nothing to be desired, and its fruit-bearing property is well developed. Riparia × Rupestris 3 309, which has recently been introduced, especially on dry stony soils, appears so far to be suitable also to the Ticino vineyards.

As regards the Franco-American stocks, Aramon × Rupestris 1 and Mourvèdre × Rupestris 1 202 have been planted, but very few Chasselas × Berlandieri 41-B. Franco-Americans have especially been used on compact calcareous soils, even when damp, where other stocks would not grow. At Arnex-sur-Orbe, in the Vaud vine district, there are very stiff calcareous marls containing a uniform amount of from 40 to 60 per cent. of very fine carbonate of lime. The whole series of Riparia × Rupestris, Solonis × Riparia 1616, the pure Americans, Riparia Gloire and Rupestris du Lot perish very quickly on such soils. Only Aramon × Rupestris 1, and especially Mourvèdre × Rupestris 1202, which is still more chlorosis-resistant, have given results which can be called favourable. It is also interesting to observe that hitherto in the Arnex vineyards, which are much infested with phylloxera, where this insect has done great damage since 1893, the above-mentioned Franco-American stocks proved sufficiently phylloxera-resistant, while the young vines of the country which had been planted along side by persons hostile to the new methods, succumbed within a few years to the persistent attacks of the insect.

In general, however, the present tendency in Switzerland is to reduce the number of Franco × American stocks used, as the reproaches levelled against the vines grafted on Rupestris du Lot are still more merited in the case of grafts upon Aramon × Rupestris and Mourvèdre × Rupestris 1202. These stocks have often a marked inclination to over-stimulate the vegetative growth of their scions; they run too much to wood. Some long methods of pruning occasionally remedy this defect, but produce large crops which are liable not to ripen well, especially in cold seasons. A delay in ripening is nearly always noticeable, under Swiss climatic conditions, in vines grafted on Mourvèdre × Rupestris 1202 or Aramon × Rupestris 1. This fact would not be of much importance if it were only a question of the quantity of the grapes, but the Swiss vine-growers are very tenacious in maintaining the quality of their local wines.

At the present time, many experiments are being made as to the possibility of substituting, especially in the case of choice vineyards, Berlandieri hybrids for the above-mentioned Franco × American stocks. Riparia × Berlandieri 420-A, and 157 157^{11} have been most used; 34 E M and Chasselas × Berlandieri 41-B appeared weaker. There still remain to be tried the stocks of the Hungarian Riparia × Berlandieri Teleki series, of which some seem worthy of experiment.

Owing to the fact that the Berlandieri variety was accustomed to a hot dry climate, the preconceived idea still prevailed only a few years ago that even the hybrids of this vine would not succeed in Switzerland. But in the experimental vineyards, the Berlandieri hybrids now bearing produce a crop which is relatively satisfactory, both as regards quantity and quality, even when growing in fairly northern situations, such as the Bernese vine-district on the shore of the Lake of Bienne. No doubt, during the first few years, the vines which have been grafted on these stocks do not develop as vigorously as their neighbours grafted onRiparia × Rupestris or Aramon × Rupestris 1 and Mourvèdre × Rupestris 1202, but they quickly make up for lost time and begin to bear. Vineyards which have been replanted with Berlandieri hybrids deserve to be studied and closely observed, but on the other hand they are not sufficiently numerous to allow of any comprehensive opinion being formed upon their value in the general reconstitution of the vineyards of Switzerland.

1160 – **Manuring of Coconuts in the Seychelles.** — RIVALTZ DUPONT. Contribution à l'étude du Cocotier aux Seychelles. — *L'Agriculture pratique des pays chauds*, Year 13, No. 122, pp. 345-355. Paris, May 1913.

The quantity of mineral matter removed from the soil by the coconut is considerable when the fibre and leaves are not returned. The coprah itself represents a very small proportion, only about one-fifth of this quantity. It is therefore desirable to utilise the leaves and other residues before considering other manures. The writer has studied the coconut fertilisers used on the two types of soil in the Seychelles.

1) *Madreporitic soils.* — They occur in the outlying islands, which are extremely fertile owing to deposits of guano having the following composition.

Moisture	7.20
Organic matter	12.50
Lime	44.30
Magnesia	1.70
Potash	0.38
Phosphoric acid	30.85
Sulphuric acid	0.69
Silica	2.06
Iron, alumina, etc.	0.36
	100 04

There is a deficiency of potash, but according to Boname the coconut utilises considerable quantities of sodium salts during the growth of the inflorescence, and it appears that less potash is consumed and the two bases are interchangeable in the requirements of this plant.

2. *Granitic soils.* — These soils require neutralising with lime or guano. Potash is generally deficient in soils that have been cultivated for a long time. Phosphoric acid is supplied economically by the guano, which costs only 16 to 24 s per ton at Victoria.

Potash manures. — Sulphate of potash should be preferred, as the unit of potash in it (at Bombay or Colombo) costs only 4*s* 9*d*, as compared with 7s in kainit. The writer recommends the application of 45 to 90 lbs. per acre buried in trenches round the trees.

Nitrogenous manures. The writer recommends green manures (*Tephrosia candida*, etc), seaweed and farmyard manure where possible. An excellent manure for coconuts could be obtained by the organisation of fisheries.

1161 - **The Forests of Taiwan (Formosa).** — THE GOVERNMENT GENERAL OF TAIWAN. Statistical Summary of Taiwan, pp. 21-24, 429-430 Tokyo, 1912.

The Island of Taiwan is rich in forests and in unreclaimed lands on the borders of those forests. Its total area, including the beds of rivers, is 13 888 sq. miles.

General Conditions of Forests. — The forests of Taiwan comprise, owing to the high altitudes of some of the mountains and to great variations in meteorological conditions, all kinds of vegetation belonging to tropical, subtropical, temperate and even to subalpine climates. The forests in the civilized part of the island had under the Chinese rule been to a large extent cleared of trees. Of late years, however, reforestation has been encouraged and a great improvement is already noticeable. The lands within the frontiers of the savage tribes are nearly all covered with primeval forests in which abound « obtuse ground cypresses » (*Chamaecyparis obtusa* Sieb. et Zucc.), camphor-trees and « pointed oak » (*Quercus dentata*).

Preservation forests. — The utilization of forests in Taiwan is still in a state of infancy. As for the official exploitation of forests, the camphor industry is the only enterprise worth mentioning. Nevertheless the indiscriminate felling of trees for purposes of reclamation has caused grave fears to arise as to the proper caring for the river courses. It follows that while it is desirable to secure increased exploitation of forests, it is important to set apart certain preservation forests in the catchment basins. The Government General is therefore establishing such forests. Their area amounts already to 59 092 acres.

Lease or sale of government forests or wild lands. — The largest number of such transactions formerly took place under the Regulations for the Provisional Sale of Forests and Wild Lands, the total area disposed of in this way up to the close of 1910 amounting to 134 750 acres. Next in area come those dealt with according to the Regulation for the Encouragement of the Cultivation of Camphor Trees. In 1911, however, more forests and wild lands were sold under the latter regulations than under the former. The total area of forest and waste land sold and leased from the beginning up to the end of 1911 amounted to about 310 660 acres.

Afforestation and nurseries. — The Government is not only conducting afforestation on its own account, but is giving encouragement to private persons to engage in the same work. The trees thus planted consist of camphor-trees, *Acacia confusa*, Merril, pines, cryptomerias and other needle-leaved and broad-leaved trees. At the close of 1911 the total afforested area was about 39 200 acres.

Forestry Experiment Stations. — Owing to the special nature of vegetation in the island, the Industrial Section of the Department of Civil Affairs established in May 1911 the Forestry Experiment Station at Taihoku with two branch stations. According to its regulations the Station is to carry out the following work:

1. Investigation and introduction of useful plants both from Japan and from other countries.

2. Investigations and experiments connected with afforestation, as well as the exploitation and preservation of forests.

3. Improvement of seedlings and their distribution.

Training of forestry experts. — The primitive state of the forestry industry in Taiwan induced the Government in 1908 to commence training men for the work, so that every year fifteen experts may be supplied to the Local Government and to private parties.

In 1910 Rules for Investigating Forests and Wild Lands were issued, according to which the surveys and investigations of forests are being actively carried out.

Arisan forests. — These famous forests, which are being exploited by the Government of Taiwan, are situated within the savage land limits and comprise a total area of 26 950 acres containing timber estimated at over 200 million cubic feet. The forests are found at altitudes ranging between 2800 feet and 8700 feet above sea-level and are reached by a forest railway 41 miles long, from the main line. The exploitation of these forests was originally started as a private undertaking but was transferred to the Government through purchase in 1910. In the lower parts of the forest are found camphor-trees, oak, *Alnus maritima* Nutt. var. *Formosana* Burkill, *Machilus Thunbergii* S. and Z. and *Quercus cuspidata* Thunb., which are broad-leaved; in the upper portions occur the conifers: *Chamaecyparis Formosensis* Mats, *Ch. obtusa* S. and Z. form *Formosana* Hay, mixed with cedars, *Pinus Formosana* Hay, *Tsuga Sieboldii* Carr. The Government has adopted the plan of entirely renovating the Arisan forests in thirty five-years by felling certain portions each year and reforesting them afterwards. According to this plan the average felling each year will amount to 3 million cub. ft. of conifers and 1 200 000 cub. ft. of broad-leaved trees. A railway and a sawmill will be built, and nurseries have been laid out on 17 acres.

Camphor industry. — As has already been stated the principal utilization of the forests of Taiwan has been by the extraction of camphor, organized as a State monopoly. The Island's Monopoly Bureau sold 7236 810 lbs. of camphor abroad and 1 137 780 lbs. to the refiners in Japan, together valued at about £ 489 300.

It is undoubted that the camphor industry has suffered more or less as the operations for the better control of aborigines progressed; but the output of the year did not fall short of the estimates, the figures being 5961 983 lbs. of crude camphor and 7019 896 lbs. of camphor oil. Of these the actual amounts received by the Monopoly Bureau were: crude camphor 6071 309 lbs. and camphor oil 7514 489 lbs., which were less than the receipts for the previous year by 1 425 622 lbs. crude camphor and 1 019 732 lbs. of camphor oil. Up to 1911 the work of distillation was conducted entirely by private firms under contract with the Monopoly Bureau; but as there was much unnecessary waste and inferior quality of product the Monopoly Bureau began experiments in distilling camphor oil and in 1911 satisfactory new distillation arrangements were completed. But as the plant is not large enough, a part of the work is still leased out to private forms as formerly.

1102 - **Experiments on the Influence of Manures in Nurseries.** — CUIF, E. Research Station of the National School of Waters and Forests), in *Annales de la Science Agronomique*, Year 30, No. 6, pp. 433-454. Paris, June 1913.

The experiments of Bartet were taken up again on a new system in 1906. This article describes the method of experimentation followed and gives the results of some of the earlier experiments.

LIVE STOCK AND BREEDING.

HYGIENE

1103 - **The Cause of Fagopyrism. A Contribution to the Study of the Fluorescent Colouring Matters in the Seedcoat of Buckwheat..** — FESSLER, KURT in *Berliner Tierärztliche Wochenschrift*, Year 29, No 28, pp 497-499 Berlin, July 10, 1913.

After making analytical and spectroscopical investigations respecting the colouring matters of the seedcoat of buckwheat, the writer is of opinion that fagopyrism is caused by the crude chlorophyll.

1164 - **On Four New Species and Two New Varieties of the Ixodid Genus *Haemaphysalis*.** — WARBURTON, CECIL in *Parasitology*, Vol. VI, No. 2, pp. 121-130, London, July 1913.

In his short introduction, the writer mentions that the examination of a vast number of ticks collected in late years from various hosts in many parts of the world, has resulted in the addition of several new species to the genus *Haemaphysalis*; the number of recognised species in this genus now reaches 43.

Just as *Rhipicephalus* is proper to Africa, so *Haemaphysalis* is essentially Asiatic, and the Indian region has furnished most of the newly discovered forms. One of the species described by the writer is African, the remainder being additions to the Indian fauna. The difficulties presented by the genus *Haemaphysalis* are chiefly due to the fact that its characters are negative; the writer, however, states that there is no lack of clearly defined forms and gives a diagnosis.

Detailed descriptions follow of the new varieties and species mentioned below:

Haemaphysalis aborensis (Yambung, India), *H. howletti* (Rawalpindi, India), *H. aciculifer* (Uganda), *H. kinneari* (Kanara, India), *H. cornigera* var. *anomala* (India), *H. inermis* var. *aponommoides* (Belgachia, Calcutta).

Eight figures illustrate the text.

1105 - **New Species of *Ixodes*.** — NUTTALL, G. H F. Notes on Ticks III: On Four New Species of *Ixodes* — *Parasitology*, Vol. VI, No. 2, pp 131-138. London, July 1913.

The new species described in this paper are of interest, although the writer is only able to deal with females, as is frequently the case with this genus. One species (*I. kempi*), allied to the North American *I. angusta*, comes from a hitherto unexplored region on the north-east frontier of India, having been collected by the Abor Expedition. Two species, *I daveyi* and *I. oldi*, are from Africa, and offer a peculiarity of structure in that they possess anal grooves having the form of a horse-shoe, an appearance only hitherto observed in three other species of *Ixodes*, all of which are African. The fourth species, *I. ricinoides*, is from China and is allied to *I. ricinus*.

The writer gives a description of the following species: *Ixodes kempi* (Kobo, Abor Country), *I. daveyi* (Rusvenzori, Uganda), *I. oldi* (Komatendu, Sierra Leone), *I. ricinoides* (Wen-chwan-hsien, China).

This article is illustrated by four text-figures.

ANATOMY AND PHYSIOLOGY

1166 - **The Distribution of Creatin in the Bodies of Mammals.** — BEKER, J. C. in *Hoppe Seylers' Zeitschrift für Physiologische Chemie*, Vol. 87, Part 1, pp. 21-37. Strasburg, August 16, 1913.

A communication giving the results of numerous analyses made to ascertain the creatin and creatinin content of the organs of cow, goat, pig, rabbit and dog. It was found that the largest amount of creatinin (314-451 mgm. per 100 gm. of organic substance) was present in the voluntary muscles, and the least (9-76 mgm.) in the thymus gland. In 100 c. c. of blood, 2.04 to 2.17 mgm. of creatin was found. In the foetal condition, mammals have little of this substance, though much is present after birth. In animals in advanced pregnancy, the absolute and relative creatinin content increases. The right horn of the uterus of pregnant animals contains more creatin than the left. The liver dehydrates creatin to creatinin.

1167 - **A Calorimeter for Small Animals.** — TANGL, F. in *Biochemische Zeitschrift*, Vol. 53, Part 1-2, pp. 21-35. Berlin, July 15, 1913.

This calorimeter is constructed on the same principle as Bohr and Hasselbalch's calorimeter devised for the determination of the heat production of the chicken embryo.

The heat production is thermo-electrically measured: the thermo-electric current produced by the increase of temperature determined by the production of the animal heat is measured by comparing it with the amount of heat derived from another source which produces an electric current of exactly the same strength (compensation). The calorimeter in question (of which the construction, working and management are minutely described by the writer, and of which he gives three diagrams), differs from the Bohr-Hasselbalch apparatus in the method adopted for the thermic isolation of the chambers containing the small animals, the isolation being made more complete by the use of Dewar flasks. The fact that the animals move during the experiment was taken into account in the method adopted. Rats, mice, frogs and leeches were used for the experiments. The duration was 10 to 24 hours; allowing 1 to 1 ½ hour to obtain the most exact compensation, there remain 8 to 22 hours for the estimation of the heat production. The weight of the body and all its excretions can be calculated to one-hundredth of a gram. The writer will communicate the results of the first experiment in a later number of the *Biochemische Zeitschrift*.

1168 - **The Effect of Previous Nutrition upon Metabolism during Fasting.** — SCHLOSSMANN, ARTHUR and MURSCHHAUSER, HANS in *Biochemische Zeitschrift*, Vol. 53, Part 4-5, pp. 265-299. Berlin, July 21, 1913.

On the conclusion of experiments on the interchange of gases in fasting children, the writers made further investigations at the Akademische Kinderklinik at Dusseldorf, in order to ascertain whether, and how far, a previous diet confined to one substance affected gaseous interchange in a hungry dog. The animals used for the experiment were first starved until they lost one-third of their weight, which was after the lapse of 16 days ; their gaseous interchange (absorption of O_2 and production of CO_2) was then determined. Then the dogs were fed up to their original weight, after which followed another fasting period of 24 hours concluded by a respiration experiment. After the animals had taken food for the second time (for some days), their gaseous exchange was investigated for a third time at the close of another fasting period of 24 hours. The food given during the experiment was fat in the case of dog I, carbohydrate in that of dog II, and protein in that of dog III.

A second experiment was undertaken by the writers for the purpose of determining in what manner metabolism took place in a dog when deprived of food for some length of time. To this end, the three dogs were deprived of food, and after fasting for 24, 2×24, 4×24, 7×24, 8×24, 12×24, and 16×24 hours, the metabolic changes were investigated.

It was found from these two experiments that the respiration quotient $\left(\frac{CO_2 \text{ production}}{O_2 \text{ absorption}}\right)$ depends, in the case of a fasting animal, upon the substances which have previously taken part in building up its body. The effect of food of one kind upon gaseous interchange during fasting is thus discernible, even after the direct effect of the last meal has long passed away. In the case of animals which have been deprived of food, anabolism is effected in a manner corresponding to the combustion processes of the previous period. Through being fed upon a single substance, such as glycogen or fat, the body accustoms itself to consume more or less glycogen, or more or less fat. In animals accustomed to an exclusive fat diet, the respiratory quotient, even when they are fasting, is nearly the theoretical fat quotient; with an exclusive carbohydrate diet, the quotient approaches the theoretical carbohydrate quotient. In the case of long and continuous fasting, the influence on metabolism produced by a previous fat diet lasts longer than the effects of a carbohydrate diet, because the glycogen supply, when much drawn upon, is more quickly consumed than the fat supply.

By means of their diet, it is thus possible to exert a direct effect upon respiratory metabolism, and one which outlasts the feeding period and prepares the organisms for the task of breaking up larger amounts of fat or of glycogen.

1169 - **The Influence of the Ingestion of Sodium Nitrate on Nitrogen Exchange.** — GRAFE, E. and WINTZ, H. in *Hoppe-Seyler's Zeitschrift für Physiologische Chemie*, Vol. 86, Part 4, pp. 283-414. Strasburg, July 21, 1913.

The writers summarize the results of the experiments of Barth, Röhman, Binz, Gerlinger, Gérard, Oppenheimer, Harnack and others upon the effect of sodium nitrate upon animal organisms.

They also give a description of their latest experiments made on a dog and three pigs, with the object of studying the action of sodium nitrate in decreasing the amount of nitrogen eliminated by the organism. They found, like Abderhalden and Hirsch, that sodium nitrate acts in four ways:

1. There is no change in the nitrogen exchange; the nitrate is again eliminated quantitatively.
2. The nitrate is eliminated quantitatively, but produces a great diminution in the loss of Kjeldahl nitrogen.
3. From 10 to 15 per cent. of the nitrate nitrogen ingested is retained in a stable form and remains in the body. At the same time, the Kjeldahl nitrogen exchange may, or may not, be modified in a favourable manner.
4. Strong doses of nitrate increase the elimination of Kjeldahlnitrogen.

The differences in the experimental results seem principally due to the amount of nitrogen administered.

1170 - **The Effect of the Iron Content of Blood Meal upon the Iron Assimilation of Animals fed with it.** — GROH, JULIUS in *Biochemische Zeitschrift*, Vol. 53, Part 3, pp. 256-258. Berlin, July 18, 1913.

The writer used as the subjects of these experiments two Yorkshire pigs weighing respectively 174 lbs. and 139 lbs. The experiment was divided into two periods, during one of which maize was fed, and during the other maize and blood meal. During the first period, which lasted 18 days in the case of pig I, and 8 days in that of pig II, the former received daily 4.4 lbs. of crushed maize, and the latter 3.3 lbs. The second period was preceded in the case of both animals by a preliminary feeding period of 21 days, and itself lasted for 10 days. During this time, the daily rations were 2.86 lbs. of crushed maize, and 0.44 lbs. of blood meal per animal. The iron content of the food and excrement were determined gravimetrically. The accompanying table gives the results of the experiment:

I. — *Maize period.*

	Pig I — gm.	Pig II — gm.
Iron ingested daily with the maize	0.425	0.323
Iron eliminated daily in the faeces	0.451	0.305
» » » » » urine	traces	traces
Balance of iron . . .	—0.026	+0.018

II. — *Maize and blood meal period.*

	Pig I — gr.	Pig II — gr.
Iron ingested daily with the maize	0.283	0.283
» » » » » blood meal.	1.206	1.206
» eliminated daily in the faeces	1.483	1.509
» » » » » urine	traces	traces
Balance of iron . . .	+ 0.006	— 0.020

Thus, in spite of the large amount of iron ingested, the animals did not assimilate an increased quantity of this substance.

1171 - **The Relation of Growth to the Chemical Constituents of the Diet.** — OSBORNE, T. B. and MENDEL, L. B. in *The Journal of Biological Chemistry*, Vol. XV, No. 2, pp. 311-320. Baltimore, Md., August 1913.

A number of charts are given showing the results of further experiments in the feeding of rats on variously prepared foods. In conformity with the results obtained previously, both by the writers and other investigators: while a milk food (in the form of a paste consisting of 60 per cent. of milk powder, 12 per cent. of starch and 28 per cent. of lard) diet was capable of supplying rats with the necessary elements for both perfect growth and maintenance, the specially prepared "natural protein-free milk", or artificial preparations from pure chemical substances made to imitate closely the composition of the "protein-free milk", though capable of supplying the elements required for maintenance failed to produce perfect growth. Young rats fed on these diets developed normally up to a certain point, and then sooner or later succumbed, but recovery always took place if milk food was added to the rations.

While all the available evidence makes it extremely improbable that the difference in the relative efficiency of these foods is due to the proteins, the carbohydrates and inorganic elements are essentially alike in all, and all have been subjected to the same amount of heating. But the inefficient foods lack those components of milk which are separated in the centrifuge or removed by filtration (cream and any cellular elements) during the preparation of the "protein-free milk". In order to investigate the influence of the former of these factors, unsalted butter was added to the diet of rats fed on "natural" and "artificial protein-free milk". This proved to have the same restoring effect as the milk food, and experiments are now being conducted to investigate the matter more thoroughly.

FEEDS AND FEEDING

1172 - **Sorghum Crops for Silage. Feeding Experiments with Dairy Cattle.** — REED, O. E. and FITCH, J. B. — *Kansas State Agricultural College, Experiment Station, Circular* No. 28, pp. 6. Kansas, 1913.

Sorghum crops, both saccharine and non-saccharine, can be used for silage with good results. The corn plant has considerable prestige as a silage crop, and has been more generally used for this purpose in Kansas than any other. As in most parts of Kansas the yield of sorghums, such as kafir and sweet sorghum, is considerably larger than that of corn (maize), it was thought that if these crops could be made into silage, they would be of par-

TABLE I.

LOT. I. — *Four cows. — Twenty-day periods.*

Period	Milk	Butter fat	Body weight
	lbs.	lbs.	lbs.
1. Corn silage in ration	1 337	55	4 108
2. Cane silage in ration	1 252	51	4 131
3. Corn silage in ration	1 178	49	4 106
Average. – 1st and 3rd periods corn silage	1 257	52	4 108
2nd period cane silage	1 252	51	4 132
Difference	5	1	24

LOT. II. — *Four cows. — Twenty-day periods.*

1. Cane silage in ration	1 192	54	4 044
2. Corn silage in ration	1 167	51	3 953
3. Cane silage in ration	989	46	4 020
Average. – 1st and 3rd periods cane silage	1 091	51	4 032
2nd period corn silage	1 167	51	3 953
Difference	76	—	79

ticular advantage to the farmers and stockmen of the western district where corn is grown with much difficulty and uncertainty. Therefore, two years ago, the Dairy Department of the Kansas Agricultural College planned an experiment to determine the value of sorghums for silage.

The first sorghum crop put into the silo was sweet sorghum, commonly called cane. If the cane is put into the silo three weeks after corn silage is made, it is found that the former does not contain as much acidity as corn silage. The cane used in this experiment was grown on upland soil on the College farm, and the sorghum crop was larger than the maize crop, which occupied part of the same field.

In the following year 1912, one silo was filled with cane, one with kafir and one with corn; here again the same results were obtained with the cane as before. It made a good quality of silage containing less acid than the corn silage.

In 1911-1912 the first feeding experiment was made with milch cows, cane silage being compared with corn silage. Two lots of four cows each were selected for the experiment.

Lot I were fed for the first twenty days on corn silage For the second 20 days (after an interval of 10 days), they were fed on cane silage. After another intervening period of 10 days the third twenty-day period began, when the cows were again fed on corn silage. The animals in lot II were fed cane silage during the first period, corn silage during the second period and cane silage during the third period. It was planned to get a direct comparison of these two feeds by comparing in each case the average of the first and third periods with the second period. Cows gradually decline in milk yield, and the average production of the first and third periods would naturally be about equal to the production of the second period. These cows were fed a grain and a hay ration in addition to the silage, the hay ration was kept constant, and the grain ration was fed in proportion to the amount of milk produced, which remained practically constant. The only change, then, in the ration during the experiment was the change made from one kind of silage to the other. The table on the opposite page gives the results of the experiment.

In studying the table of results on lot I, we find an increase in live weight during the cane silage feeding period; this increase is also observed on taking averages of the first and third periods, while the increase in milk and butter fat production during the corn silage feeding is so small as to be negligible.

Lot II gave similar results. The corn silage produced more milk and butter fat than the cane silage, while the cane silage caused gains in live weight. The results of the whole experiment suggest that cane silage is more fattening than corn silage.

During the winter of 1912-1913 a feeding experiment was conducted with fifteen dairy cows, in which comparison was made of the respective merits of three crops for silage: kafir, cane and corn. The general plan of the experiment was similar to that of the preceding year. Fifteen cows were divided into three lots. Lot I contained six cows which were used to compare kafir silage with corn silage, lot II consisted of five cows fed on cane and kafir silage, while in lot III four cows were used to determine the comparative value of corn silage and cane silage. The cattle in each lot were fed for three periods of 30 days each with a ten-day period intervening between the first and second periods, and also between the second and third periods. The experiment included only the 30 days in each period. Table II gives the results of the second trial.

The results of the experiments in Lot I indicate that corn silage is slightly superior to kafir silage for milk production, while kafir silage proved the more fattening.

In the second lot kafir silage proved much better than cane for milk production. The cows made a very slight gain in body weight while on the cane silage.

In the third lot, corn proved superior to cane silage. The former produced a larger milk yield and a very slight gain in live weight.

TABLE II.

LOT I. — *Kafir Silage versus Corn Silage.*
(Six Cows — Thirty-day periods).

Period	Milk	Butter fat	Body weight
	lbs.	lbs.	lbs.
1. Kafir silage in ration	3 373	142	6 010
2. Corn silage in ration	3 383	140	5 994
3. Kafir silage in ration	3 339	139	6 021
Average 1st and 3rd periods, kafir silage	3 356	140	6 015
2nd period, corn silage.	3 383	140	5 994
Difference . . .	27	—	21

LOT II. — *Cane Silage versus Kafir Silage.*
(Five cows — Thirty-day periods).

1. Cane silage in ration	2 384	107	4 852
2. Kafir silage in ration	2 492	112	4 879
3. Cane silage in ration	2 139	98	4 927
Average 1st and 3rd periods, cane silage	2 261	102	4 890
2nd period, kafir silage	2 492	112	4 879
Difference . . .	231	10	11

LOT III. — *Corn Silage versus Cane Silage.*
(Four Cows — Thirty-day periods).

1. Corn silage in ration	1 953	89	3 743
2. Cane silage in ration	1 832	86	3 747
3. Corn silage in ration	1 852	85	3 755
Average 1st and 3nd periods, corn silage	1 902	87	3 749
2nd period, cane silage.	1 832	86	3 747
Difference . . .	70	1	2

In summing up the work of both trials, the following conclusions may be drawn.

1. Corn silage is slightly superior as a milk producer to silage made from either kafir or cane.

2. Kafir silage ranks second as a feed for milk cows.

3. Cane silage ranks third as a milk producer.

In both trials the cattle gained in live weight on cane silage more readily than on silage made from kafir or corn. This fact would indicate that the former contains more carbohydrates and sugar, or fattening substances, than the other feeds. In the writers' opinion, cane silage would prove the equal of corn or kafir silage if more protein and less fat-forming nutrients were fed in the grain ration, so that the animal could use the nutrients more economically.

Although kafir and cane silage were shown by the experiments to be slightly less valuable than corn silage, there are other factors that must be considered; namely yield and adaptability to local conditions. Without doubt, the greater yield of cane and kafir to the acre will offset the slight increase in feeding value to be obtained from corn silage. Kafir and cane are drought resisting crops, they can be grown over a wider territory than corn, and yield from one-third to one-half more tonnage to the acre.

During both trials the acidity of the cane silage was never more than that of the corn silage. In the second trial the average acidity for the three different kinds of silage was as follows: corn, 2.03 per cent.; cane, 1.46 per cent. kafir, 1.43 per cent.

It was also noted during the experiment that most of the cane seed and a great amount of the kafir seed passed through the animals undigested. This suggests that the nutritive value of these crops as silage is limited to that of the stalks and leaves. The quality of silage obtained from all three crops was very good. The kafir silage was perhaps the poorest on account of its being immature. The cows eat the silage with relish, and appeared to prefer the cane silage.

The silage was stored in wooden-stave and in cement silos, and kept equally well in either case. The time of cutting cane and kafir is all-important in making good silage from these crops. They should be practically mature; that is the seed should be ripe. If cut too green the silage is sour. After a heavy frost, the crop should be cut and siloed immediately. If it dries out too much, sufficient water should be added to enable it to pack well.

1173 - **Manioc Roots and the Residues of their Elaboration.** — KLING, M in *Die Landwirtschaftlichen Versuchsstationen*, Vol. 82, Part 3-4, pp. 211-233. Berlin, July 17, 1913.

From the roots of the manioc (*Manihot utilissima* Pohl) two kinds of starch flour are obtained, one of which is used as an article of diet, while the other is the starch (*Appreturmittel*) of commerce. Recently, the residues of this industry have also made their appearance on the market, especially in the form of cattle feeds.

TABLE I. — *Composition of dried manioc roots.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	11.28	—
Crude protein	1.35	1.52
Crude fat	0.27	0.30
N-free extract	83.27	93.86
Crude fibre	1.98	2.23
Ash	1.85	2.09

TABLE II. — *Composition of the starch made by Messrs. Zwick & Sons of Neustadt.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	10.85	—
Crude protein	1.53	1.72
Crude fat	0.38	0.42
N-free extract	83.68	93.86
Crude fibre	1.55	1.74
Ash	2.01	2.26

Manioc is cultivated in the Malay Peninsula, in Africa, in South America, and especially in Java.

The residues of the Javan tapioca, called "tapioka ampas", find their way, like tapioca itself, to the European markets. The tapioca exported from Java in 1907 amounted to 21 000 tons, and in 1907 to 44 000 tons.

The Javan manioc roots which are only suitable for making commercial starch are sent to Germany and used as raw material, chiefly by the firm of Zwick and Sons, of Neustadt a. d. Hardt. The residues of this product appear on the German market under the names of "Stärkefuttermehl" (Starch feeding meal) or "Futtermehl Z" and "Stärkeschlempe". In the European feeding-stuffs trade the manioc root residues are also known as "Hollandisches Futtermehl", Tapioka-Ampas", "Strumbin", "Stärke-

TABLE III. — *Composition of the « Stärkefuttermehl » of Messrs. Zwick and Sons of Neustadt.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	10.93	—
Crude protein	3.59	4.03
Crude fat	0.74	0.84
N-free extract	75.95	85.27
Crude fibre	6.10	6.84
Ash	2.69	3.02

TABLE IV. — *Composition of the « Stärkeschlempe » of Messrs. Zwick and Sons of Neustadt.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	86.56	—
Crude protein	0.25	1.86
Crude fat	0.03	0.22
N-free extract	12.04	89.58
Crude fibre	0.78	5.81
Ash	0.34	2.53

abfall. ", " Pflanzenmehl ", " Schlempemehl " and " Wcbco ". These residues are also often mixed with differend meals used as feeds.

No reliable data existed as to the chemical composition of the manioc roots, starch-meals, and residues of the roots. For this reason, the writer made the analyses given in the accompanying five tables.

The writer has also made a detailed analysis of the composition of the manioc roots. When well cleaned, they generally contain a little less moisture, protein, fibre and ash, but a little more fat and nitrogen-free extract than are given in Table I. The analyses show that the roots, like the residues derived from them, are poor in protein and fat, and that their food value depends chiefly upon their starch content. No experimental data are available as to their digestibility. The carbohydrates, especially the starch, of the " Stärkefuttermehl " ought to be easily digested.

TABLE V. — *Percentage composition of the manioc root residues known as « Stärkeabfall » and « Pflanzenmehl ».*

Constituents	Fresh material		Dried material	
	Stärkeabfall — per cent.	Pflanzenmehl — per cent.	Starkeabfall — per cent.	Pflanzenmehl — per cent.
Moisture	10.3	11.68	—	—
Crude protein	1.12	1.25	1.25	1.41
Crude fat	0.12	0.21	0.13	0.24
N-free extract	80.25	76.60	89.46	86.73
Crude fibre	5.62	4.06	6.27	4.60
Ash	2.59	6.20	2.89	7.02

Amongst the residues analysed, the "Stärkefuttermehl" prepared by Messrs. Zwick & Sons possesses the greatest feeding value. The writer puts it at about £ 7 a ton, that is about the same as potato flakes. If the starch value of potatoes is taken at 77 per cent., that of the "Stärkefuttermehl" would be 70 per cent.

It is recommended to feed this product mixed with substances containing fat and protein and should these be poor in lime, phosphate of lime should be added. "Stärkefuttermehl" should be an especially suitable feed for calves. From the point of view of the dry matter, "Stärkeschlempe" is equal to "Stärkefuttermehl", but it has the disadvantage of not keeping longer than 14 days. The writer recommends "Stärkeschlempe" especially for pigs; it can be mixed with nitrogenous and fatty substances and those containing lime. Wet "Stärkeschlempe" costs about 3s per bushel, a price which nearly corresponds to its actual feeding value, when the cost of carting is not very high. As for the value of the other similar commercial products, what has already been said as regards "Stärkefuttermehl" holds good. Much care is required in purchasing these products, which are often adulterated by the addition of over 40 per cent. of carbonate of lime.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

1174 - **The Show of Breeding Stock at Souk-Ahras, Algeria.** — MELLIS, C. in *La Revue des Colons de l'Afrique du Nord*, Year 2, No. 23, pp. 362-363; No. 24, pp. 379-383. Algiers, June 1913.

At the second show of breeding stock organized by the Breeders' Syndicate of Souk-Ahras, held in May 1913, a thousand animals were entered; of these, 560 were awarded prizes.

The class for pure Tarentais cattle was good; the animals seem not to have lost anything in milk production or general characteristics in their new home, though they are somewhat darker and more irregularly marked.

The native cattle were chiefly of the Guelma breed, common in the mountainous parts; these animals are of a bright gray colour, with body compact and meaty, legs short, chest deep and wide. The cows are fairly good milkers; they cross well with Tarentais bulls.

The cross-bred Tarentais × native cattle showed a great improvement over those of the previous year. Three-quarter-breds are difficult to distinguish from the pure Tarantais; the half-breds too, especially the bulls, show a predominance of the Tarentais blood, being quite distinct from the native cattle in the high-set-on tail, wide hips and other characters; heifers at one year may weigh 550 lbs., and at two years 660 lbs. The writer believes this cross will be a success and will keep on improving under careful management and feeding.

HORSES, ASSES AND MULES

1175 - **Modifications in the Exterior Conformation of the Half-Blood Horse during Growth, in Prussia.** — WÖLTZ, W. in *Landwirtschaftliche Jahrbucher*, Vol. XLIV, Part 3, pp. 409-436. Berlin, May 1913.

It is some time since the writer pointed out the necessity of having measurements made on animals during the period of growth with the object of determining the intensity of development of the several parts of the body. A great number of measurements have been taken, especially on the basis of Lyotin and Nathusius' works and systems, on adult animals, but there is a great scarcity of such data on animals during growth. After mentioning the work done in this connection by Gisler, Mieckley, Schröder and Schöttler, the writer reports upon the systematic measurements made by him since August 1908, upon seven half-blood foals of East Prussia, about 6 months old. In August 1909 and 1910 the measurements were repeated upon the same animals. Thus the foals were measured at the successive ages of 6, 18 and 30 months.

Immediately after they were purchased the animals fell sick of glandular inflammation, which for a certain period retarded their development; nevertheless they were well cared for and their food was especially rich.

The measurements were most carefully taken so as to exclude errors as far as possible.

Some inacccuracies, however, must be considered inevitable, especially for certain measurements (thus for instance the length of the neck) which are difficult to take on young spirited horses. But taking an average of the figures obtained from seven animals tends to produce a compensation of eventual errors. Especial difficulties were encountered in measuring the length of the fore and hind cannon-bones. The writer measured these bones in the fore limbs starting from the pisiform bone and reaching the sesamoids and in the hind limbs from the point of the calcaneum to the sesamoids. Both measures thus taken exceed the real lengths of the metacarpus and of the metatarsus by about one-third, as they include the carpus in the fore limb and the tarsus with the calcaneum in the hind one. The circumference of the cannon-bone was always taken on the right limb.

The writer gives the results of his measurements in 14 tables, of which the last gives the averages of the 7 foals that were measured, both in absolute figures and in figures relative to the wither height taken as 100. In three separate columns the percentages of growth of the various parts of the body in the periods of 6 months, 1 ½ years and 2 ½ years are given.

Table I (next page) gives the summary of the data collected.

In two other tables are given respectively the absolute increase in centimetres and the increase per cent. of the various parts of the body. The measures are arranged in the order of their respective intensity of increase.

The figures given in Table I confirm the well-known fact that foals have in comparison much longer legs and shorter bodies than adult horses, while their chest and pelvis are also comparatively narrower.

It appears also that the lengthening of the body is specially connected with the growth of the barrel, that the length (upper and lower) of the neck increases relatively to the height of the withers, whilst (always proportionately) the length of the cannon bones diminishes and the ratio between the height of the withers, of the back and of the croup remains nearly constant. Always relatively, the dimensions of the body (breadth, depth of chest and width between hip-bones), the length of the shoulder-blade and the girth, and to a slight extent the circumference of the cannon bone, increase. The circumference of the hock diminishes.

In a separate table the writer compares the results obtained by him on half-blood foals from East Prussia with those obtained by Schöttler on Hanoverian half-bloods. These appear more precocious than the former.

The writer then examines the table in which the absolute growth, in centimetres, is given for the several parts of the body in progressive order.

He notes that the smallest increases are in those meaurements that depend particularly upon the increase in length of the cannon-bones. The other measurements follow in the order given in the table, with a maximum for the girth measurement.

Examining the table which shows the data referring to the percentage increase of the several parts of the body that were measured, in the order of intensity of growth, the writer remarks that it varies greatly, ranging from a minimum of 3 per cent. (height at withers) to a maximum of 33 per cent. (width at hip bones). The increase in length of the fore and hind cannon-bones was respectively 6.5 and 6.1 per cent., agreeing with Schöttler's observations on Hanoverian foals, in whch he also recognized the slight development of the metacarpus and metatarsus. The other measurements follow in the order set forth in the table. Among others the high percentage of the increases in the length of the neck, of the breadth and depth of the chest, and of the breadth between the hips are noteworthy.

In order to give a graphic demonstration of the foals that were measured the writer has added to his work a plan showing the three outlines corresponding to the average of all the measurements, taken respectively at the ages of 6, 18 and 30 months.

TABLE I.

Numerical order	Measurements	I			II			III		
		Average of measurements of 6 and 7 foals respectively.						Increase compared with measurements of 1908		
		1908	1909	1910	1908	1909	1910	In 1909	In 1909-1910	In 1908-1910
		cm.	cm.	cm.	%	%	%	%	%	%
1	Length of body from point of shoulder to point of ischium	120.9	135.4	146.0	96.9	98.7	99.5	12.0	8.7	20.7
2	Length of forequarters	29.6	32.0	34.2	23.8	23.1	23.3	8.1	7.4	15.5
3	» of barrel	53.0	60.6	66.8	42.5	44.2	45.7	14.3	11.7	26.0
4	» of hind quarters . . .	36.5	41.1	44.7	29.3	30	30.5	12.6	9.8	22.4
5	» of pelvis	—	44.5	46.4	—	32.5	31.6	—	—	—
6	From the pisiform bones to the sesamoids.	29.3	30.4	31.2	23.5	22.2	21.3	3.8	2.7	6.5
7	From the calcaneum to the sesamoids	41.0	42.4	43.5	32.9	30.9	29.6	3.4	2.7	6.1
8	Length of shoulder-blade . . .	37.9	42.4	46.7	30.4	30.9	31.8	11.9	11.3	23.2
9	» of neck (upper)	54.3	62.5	69.9	43.5	45.6	47.6	15.1	13.7	28.8
10	» » (lower)	36.6	43.5	45.8	29.4	31.7	31.2	18.8	6.3	25.1
11	» of head	—	—	—	—	—	—	—	—	—
12	Height of withers	124.7	137.1	146.8	100	100	100	10.0	7.8	17.8
13	» of back	120.5	133.2	141.5	96.6	97.2	96.4	10.5	6.9	17.4
14	» of croup	127.6	140.9	149.8	102.3	102.8	102.0	10.5	6.9	17.4
15	» of sternum (behind elbows)	73.6	77.1	81.8	58.9	56.3	55.8	4.8	6.4	11.2
16	Length of ilium	120.3	131.5	139.5	96.5	95.9	95.0	9.3	6.6	15.9
17	» of ischium	113.7	119.1	124.9	91.4	86.8	85.1	4.8	5.1	9.9
18	» of knee-cap	85.1	90.4	95.5	68.2	65.9	65.1	6.2	6.0	12.2
19	» of hock.	56.7	57.4	58.4	45.4	41.9	40.0	1.3	1.7	3.0
20	Height of the shoulder joint. .	93.6	97.5	102.0	75.0	71.2	69.5	4.2	4.7	8.9
21	» of elbow	78.4	81.8	85.6	62.9	59.7	58.2	4.3	4.9	9.2
22	» of pisiform bone . . .	42.5	44.3	46.3	34.2	32.3	31.5	4.3	4.6	8.9
23	Depth of chest	51.1	60.7	64.5	41.0	43.8	44.0	18.8	7.4	26.2
24	Front width of chest	29.1	33.1	35.5	23.4	24.2	24.2	13.8	8.2	22.0
25	Width of chest behind shoulders	27.0	32.4	34.7	21.6	23.3	23.7	20.0	8.5	28.5
26	Breadth within hip-bones . . .	35.7	42.6	47.6	28.6	31.1	32.3	19.3	14.0	33.3
								cm.	cm.	cm.
27	Girth	133.7	150.4	169.1	107.2	109.7	115.2	16.7	18.7	35.4
28	Circumference of fore cannon bone	15.6	17.5	18.5	12.5	12.9	12.6	1.9	1.0	2.9
29	Circumference of hind cannon bone	17.1	19.6	20.6	13.7	14.3	14.1	2.5	1.0	3.5
30	Circumference of hock	35.0	37.4	38.8	28.1	27.3	26.4	2.4	1.4	3.8

TABLE II.

Numerical order	Measurements	Average increase in relation to the measurements of 1908 was		
		in 1909	in 1909-1910	in 1908-1910
		cm.	cm.	cm.
1	Height of withers	0.7	1.0	1.7
2	Length of pelvis	—	1.9	—
3	From the pisiform bone to the sesamoids	1.1	0.8	1.9
4	From the calcaneum to the sesamoids.	1.4	1.1	2.5
5	Circumference of fore cannon-bone	1.9	1.0	2.9
6	» » hind » »	2.5	1.0	3.5
7	Height of pisiform bone	1.8	2.0	3.8
8	Circumference of hock	2.4	1.4	3.8
9	Length of fore hand	2.4	2.2	4.6
10	Front breadth of chest	4.0	2.4	6.4
11	Height of elbow	3.4	3.8	7.2
12	Breadth of chest behind shoulders	5.4	2.3	7.7
13	Length of hind hand	4.6	3.6	8.2
14	Height of sternum	3.5	4.7	8.2
15	Height of shoulder joint	3.9	4.5	8.4
16	Breadt of shoulder-blade	4.5	4.3	8.8
17	Length of neck (lower)	6.9	2.3	9.2
18	Height of knee-cap	5.3	5.1	10.4
19	» of ischium	5.4	5.8	11.2
20	Breadth between hip bones.	6.9	5.0	11.9
21	Depth of chest	9.6	3.8	13.4
22	Length of barrel	7.6	6.2	13.8
23	Length of neck (upper).	8.2	7.4	15.6
24	Height of ilium	11.2	8.0	19.2
25	» of back	12.7	8.3	21.0
26	» of withers	12.4	9.7	21.1
27	» of croup	13.3	8.9	22.2
28	From point of the shoulder to point of ischium . .	14.5	10.6	25.1
29	Girth	16.7	18.7	35.4

Table III.

Numerical order	Measurements	Average increase in relation to the measurements of 1908 was		
		in 1909 %	in 1909-1910 %	in 1908-1910 %
1	Height of hock	1.2	1.8	3.0
2	From calcaneum to sesamoids	3.4	2.7	6.1
3	From pisiform bone to sesamoids	3.8	2.7	6.5
4	Height of shoulder joint	4.2	4.7	8.9
5	» of pisiform bone	4.3	4.6	8.9
6	» of elbow	4.3	4.9	9.2
7	» of ischium	4.8	5.1	9.9
8	» of sternum	4.8	6.4	11.2
9	» of knee-cap	6.2	6.0	12.2
10	Length of fore hand	8.1	7.4	15.5
11	Height of ilium	9.3	6.6	15.9
12	» of back	10.5	6.9	17.4
13	» of croup	10.5	6.9	17.4
14	» of withers	10.0	7.8	17.8
15	From point of shoulder to point of ischium	12.0	8.7	20.7
16	Front width of chest	13.8	8.2	22.0
17	Length of hind hand	12.6	9.8	22.4
18	» of shoulder-blade	11.9	11.3	23.2
19	» of neck (lower)	18.8	6.3	25.1
20	» of barrel	14.3	11.7	26.0
21	Depth of chest	18.8	7.4	26.2
22	Breadth of chest behind shoulders	20.0	8.5	28.5
23	Upper length of neck	15.1	13.7	28.8
24	Breadth between hips	19.3	14.0	33.3

CATTLE

1176 - **Cattle Breeding and its Importance in German East Africa. The Various Breeds of Cattle.** — LICHTENHELD, G. in *Der Tropenflanzer*, Year 17, No. 8; pp. 405-430. Berlin, August 1913.

The 2 300 000 head of cattle in German East Africa are very unequally distributed. About one-third of the Protectorate is unsuitable for cattle owing to tsetse, and much of the rest is not utilized.

All the cattle, with the exception of some animals imported from Europe, are zebus. They mostly belong to *Bos zebu africanus*, but some are *B. z. indicus* (called Sokotra cattle by the writer). Among the African zebus, the writer draws a distinction between those with large horns and small humps (Watussi, numbering 750 000) and those with small horns and large humps (Masi, 1 500 000).

I. *The Masai zebus.* — Bred chiefly by the Masai tribe. Colour usually red or yellow and brown, but frequently black or white and grey. Pigmentation generally dark, rarely similar to the coat colour. Skin thick and coarse; hair smooth, short, with a silky lustre. Head small, often hornless, but frequently with short, stout horns bent slightly upwards. Face slightly dished. Ears medium-sized, directed sideways and slightly backwards. Neck of medium length, with the dewlap usually much developed. Withers wide; hump 12 inches high, and usually more developed in the male than in the female. Shoulders sloping and muscular. Chest relatively deep, occasionally somewhat flat. Body barrel shaped. Back and loins of medium length and in a straight line. Croup weak and sloping. Haunches very fleshy. Limbs short, but with small, regular bones. The legs are sometimes crooked, but to no great extent. Tail set on rather low, long and thin, with a large tuft. Hoofs small, hard, and varying in colour from grey to black. Udder small, fleshy, almost hairless, with short, fleshy teats. The size of the animals varies in different localities and attains an average of 4 ft. 3 in. to 4 ft. 7 in., sometimes 5 ft. or 5ft. 6 in., in height. The best developed animals are usually found in the hot dry district, while the less developed occupy the lower ground.

The Masai zebu matures late; cows do not come into heat until the age of 2 ½ years. The bulls and cows are full grown between 3 ½ and 4 ½ years, but steers may go on developing until they are 6 years old.

The Masai zebu is a thrifty animal, and very resistant to weather and disease. The calves are subject to Texas fever, which is prevalent throughout the Protectorate and causes 1 per cent. loss, if the animals contract it during the first months of their life. If the disease appears later, the losses can amount to 20 per cent or over. The same occurs in the case of anaplasmosis. Coast fever, in the districts where it is endemic, is responsible on an average for the death of 30 per cent. of the calves; the remainder enjoy life-long immunity; but if this disease is introduced into a hitherto healthy herd, it may carry off 90 per cent. The number of cattle attacked by tuberculosis is estimated by the writer at under 1 per thousand.

The Masai cows calve regularly every year. Calving is usually normal, no assistance being needed, and it is followed by no bad after-effects. The milk production is normally below 70 gallons per lactation period, but under favourable conditions may be more.

The beef production of a two-year-old steer is easily over 220 lbs.; steers of 5 years of age give up to 440 lbs. of beef, and those of 7 years up to 770 lbs. The weight of the hump can attain 24 lbs. The meat contains coarse fibres and is less marbled than that of European breeds. The fat accumulates chiefly below the skin and round the viscera. These zebus are satisfactory draught animals.

II. *The Watussi zebus.* — These are only bred by the Watussi tribe, and are a little smaller than the previously mentioned animals. Coat usually red, brown or yellow. Head and horns longer then in the Masai type. Chest deep, but flat. Line of back and croup straight. Legs often crooked. Milk production twice as large as in the case of the Masai type, but meat production poorer. The animals are less resistant to epidemics and other forms of disease than the Masai zebus ; they cannot stand short rations or want of water as well as the latter. These faults recur in crosses between the two types. The Watussi are also less fertile and develop later than the Masai zebus.

III. *The Sokotra zebus.* — These were introduced direct from India by merchants and are much appreciated for their good milking qualities. They are especially suited to the coast zone, and will, in the opinion of the writer, be still more popular in the future.

IV. *Cattle keeping and breeding by the natives.* — Most of the tribes keep their cattle in the open, but some give them shelter at night. The calves are only put with their mothers for suckling. As the natives milk all the cows the calves generally suffer from under-feeding. The large and the small domestic animals do not graze together. During the rainy season, and for a short time after, the animals are at grass for some hours ; during the dry season, they remain in the field all day. When the natural supplies of water are exhausted, the natives dig wells to obtain drinkable water.

In some districts where water is scarce, the animals are fed during the dry season on succulent banana stems. One stem daily is considered sufficient for an animal in the cow-house. The natives have no idea of making hay, or of storing fodder for times of dearth. When the grass of a pasture becomes scanty, the native sets forth in search of fresh fields, or sends some of his cattle into good grazing districts, paying in return for the pasturage the milk produced by the cows during their stay.

As a rule, the bulls used for breeding purposes are selected. They are generally chosen for shape, colour and maternal descent, the offspring of good milkers being given the preference. Unsuitable animals are castrated. The proportion of bulls ready for service is about 1 to every 20 cows. The cows are chosen for their good milking properties. A well-proportioned milch cow may be worth as much as three bullocks. As the natives use all their cows for breeding the herds become very heterogeneous. According to the writer, there is no selection of cows for breeding, for the idea is to use all the available animals, and thus increase the size of the herds as much as possible. In order to avoid in-breeding, the native exchanges his breeding animals with those of other cattle owners. The Masai zebus are often crossed with the Watussi, but the offspring produced by crossing these two types with the Sokotra zebu enjoy equal favour. Most of the native tribes still refuse to introduce into their herds European cattle or their hybrids.

V. *Cattle keeping and breeding by Europeans.* — The methods adopted by the Europeans differ little from those which obtain amongst the natives. The chief aim of the European breeders is to have as large herds as possible. As a rule, their herds are less valuable than those of the natives, which is the more to be regretted as they import many bulls from Europe. The writer thinks that it would be best for the European graziers to begin improving the native breeds before trying to introduce European blood. It has been found that European cattle and their crosses have little power of resisting the climate and the diseases peculiar to the country. It is true that some success has been attained recently in rendering European cattle immune from the most serious diseases, such as anaplasmosis and Texas fever, but for various reasons, immunisation cannot be practised generally. European cattle if introduced should, according to the writer, be kept in the cow-shed.

Alongside of ordinary farms, where, as on those belonging to the natives, the chief attention is paid to meat production, there are also some dairy farms in the Protectorate. The milch cows on these farms are Sokotras or of European breeds; they are always kept in the stall, and receive in addition to grass and hay " mogo " (1) and oil cakes.

VI. *The value and importance of the cattle.* — The price of a steer yielding 440 lbs. of beef varies from 25*s* to 90*s* according to locality. Cows fetch a quarter or half as much again.

At Daressalam a gallon of milk costs 2*s* ; at other places its price is from 2 ½*d* to 10*d*. One pound of fresh butter costs about 3*s* at Daressalam ; 1*s* 6*d* at Moschi ; 11*d* at Iringa. One pound of "samli" (2) costs 3*d* at the chief places of export.

Until lately, the cattle of German East Africa have been chiefly important as providing food for the native breeder, whose prosperity depends for the most part upon his herds. Recently, however, they have also begun to supply the plantation workers and the town populations. Last year, about 12 000 oxen were sent for slaughter to the districts of Tanga and Wilhelmstal. On the other hand, the writer estimates the number of animals which annually find their way to the market at over 40 000. Considering the small amount of business, and the low price of meat, there is no question of the rational utilization of the cattle. In all breeding districts the overproduction of beef-producing animals is noticed. The writer considers that the best means of preventing a crisis in this direction would be the establishment of factories for canning meat and preparing meat extract.

The number of cattle exported from the Protectorate was 545 in 1910, 240 in 1911, and 179 during the first half of 1912. As regards " samli ",

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(1) This is a tuber of which the feeding value is about equal to that of the potato.

(2) Native-made melted butter

77 300 lbs. were exported in 1910, 659 500 lbs. in 1911, and 399 600 lbs. during the first half of 1912.

The duty on exported cattle amounted to about £17 000 in 1910 and 1911, and £10 350 during the first half of 1912. The small numbers exported are partly due to the prohibition of the importation of cattle into the neighbouring colonies (except Zanzibar and the Congo) and the law forbidding cows being exported from the Protectorate. As draught animals and producers of manure, the cattle in question are of no interest.

VII. *Methods of improving cattle-breeding.* — The writer is of opinion that it would be worth while to improve the breeds of cattle in German East Africa. In order to do this it would be necessary to improve the management of the animals, abandon the practices which lead to the underfeeding of the calves, not allow the heifers to be served by the bull at such an early age, and diminish the size of the herds kept in districts poor in forage. Hay should also be grown on the farms kept by Europeans, and maize, potatoes, lucerne, etc., cultivated on dairy farms. A better selection of stud animals is very desirable ; in-breeding should be avoided, and only immune bulls used in districts where coast fever is prevalent.

The writer advises crossing native and European cattle only for the purpose of improving the milk production, and considers that such crossing should be practised by the European farmers exclusively.

The article is illustrated with pictures of the animals.

1177 – **Welsh Black Cattle.** — SABORKSY, PAUL in *Mitteilungen der Landwirtschaftliche Lehrkanzeln der k. k. Hochschule für Bodenkultur in Wien*, Vol. 1, Part 4, pp. 511-585. Vienna, May 8, 1913.

In a section of his comprehensive work, the writer gives an account of the range of the Welsh Black Cattle and of cattle breeding and agriculture generally in Wales. He then passes on to describe the nature of the skin and coat of the above-mentioned cattle. In section III are given the external measurements of 90 of these animals.

The writer has taken skull measurements according to the Adamerz method. The measurements of 15 typical skulls, of which two are of the South Wales type, are given in section IV. Attention is here drawn to the differences between the two types, which consist chiefly in the form and course of the supra-orbital canals and the lachrymal bone, as well as in the size of the angle of the interparietal bone, the length of the temporal fossa and of the occiput. The mandible, the palatine, the nasal, and other bones in both types show indication of descent from a *brachyceros* type, while the maxilla recalls that of *Bos primigenius*. The skulls from North Wales show more signs of *primigenius* descent than do those from the South part of the Principality. The writer concludes from the measurements that both types are nearly related, but owing to the great differences in the skulls, he thinks they should be regarded from the agricultural standpoint as independent race types. A mixed origin is unlikely. It is certain that the Welsh black cattle, like other old British breeds, are descended from a specific wild type, perhaps a variety or a subspecies of

Bos primigenius, and thus occupy a special position in the stock-breeding system. From the combination of *primigenius* and *brachyceros* characters in the skull, the writer classifies this breed as *pseudoprimigenius*.

1178 – **Carcase Test of the Piedmontese Breed of Cattle** — MASCHERONI, E. in *Cronaca Agricola*, Year XVIII, No. 12. Turin, July 1, 1913.

Though the Piedmontese cattle are considered a general purpose breed (meat, milk and work), nevertheless as producers of meat they are doubtless among the best Italian breeds, if not perhaps the best of all. Formerly this breed contributed largely to the exportation of cattle to France and to Switzerland.

The Piedmontese cattle mature early; frequently it is found that at the age of 18 or 20 months animals of this breed weigh 1320 lbs. and upwards, and at the age of four years considerably above 2 200 lbs. The meat is of excellent quality. The animals are easily fattened without much expense and the percentage of dead weight is high.

Doctor Poli, chief of the Municipal Veterinary Office of Turin, was entrusted by the Ministry of Agriculture, in 1887, with the task of determining the net carcase weights of Piedmontese cattle; from observations made by him it appears that of 31 head of cattle taken at random, 14 gave dead weight percentages ranging between 49 and 55, and 17 above 55; of the latter 9 were above 60 and one reached 66.

1179 – **The Correlation between the Percentage of Milk Fat and the Quantity of Milk Produced by Ayrshire Cows.** — *Journal of the Board of Agriculture*, Vol. XX, No. 5, pp. 447-448. London, August 1913.

An investigation was undertaken by the Board of Agriculture owing to a desire for figures showing as definitely as possible the extent of the correlation between the quantity and quality of milk yielded by a cow. The work of preparing a report on the subject was entrusted to Mr. H. D. Vigor, an Assistant to the Head of the Statistical Branch of the Board. It was thought desirable to include in the calculations such other variable factors as might affect the milk yield of the cow and the percentage of fat contained in the milk, and for this reason it was decided to deal also with the age of the cow, the duration of lactation and the date of calving. The conclusions are derived from data contained in a Report of the Ayrshire Cattle Milk Records Committee.

The conclusions drawn are:

1) After allowance has been made for the varying age and duration of the lactation period of the Ayrshire cows under examination, the milk of cows which gave the larger average weekly yields of milk shows a definite and appreciable tendency to be poorer in milk fat than the milk of cows which gave lower average weekly yields.

2) The duration of lactation had no significant influence upon the average percentage of milk fat produced.

3) The percentage of milk fat showed a slight, but definite, tendency to be lower in the older than in the younger cows, after due allowance has been made for the average weekly yield of milk.

4) Taking the herd as a whole, the duration of the lactation bore no relation to the average weekly yield of milk produced by cows. There is thus no evidence in the case of these cows, of a selective action in favour of retaining in milk those cows that gave a better average yield of milk than others.

5) In the herd under examination, the older cows show a definite and appreciable tendency to give larger yields of milk than the younger cows. This may possibly be due partly to a selective action in weeding out cows which proved unpromising as regards their milk yield when young, and partly to a physiological tendency for older cows to give better yields than younger ones.

6) The duration of lactation has possibly tended to be longer in older than in younger cows, although the evidence on this point is not quite definite.

If it is supposed that the average age and duration of lactation remain unaltered, it appears possible to select a herd with an average yield of nearly 800 gallons per cow per lactation (as compared with the 1909 average yield of 637 gallons), without reducing the average percentage of milk fat produced in the herd as a whole below 3.58 per cent., as compared with the present average of 3.68 per cent. It must be borne in mind, however, that while this result may be regarded as the most probable, in the long run the certainty of attaining it diminishes when only a small number of cows is being dealt with, and increases proportionately with the number of cows in the herd in which the policy of selecting cows with higher milk yields is pursued.

1180 - **Investigations into the Daily Variations in the Specific Gravity and Fat Content of the Milk of a Large Herd** (1). KLOSE in *Bericht über die Tätigkeit des Milchwirtschaftlichen Instituts zu Proskau für das Jahr* 1912-13, pp. 11-12. Oppeln, 1913. *Milchwirtschaftliches Zentralblatt*, Year 42, Part 13, pp. 385-392. Hanover July 1, 1913.

In March, May, July and October, 1912, the writer investigated the specific gravity and fat content of the milk of 70 cows belonging to the herd of the Proskau Dairy Institute. Tests were made thrice daily. These months were selected, as it was important that the period of investigation should include months during which the food was qualitatively the same, and others when the rations varied. The cows' rations in March consisted of hay, straw, brewer's grains, and sunflower and sesame cakes.

In May, the animals received nearly the same food as in March for three days, and then were put out to grass until the end of July. From the 6th of October, the cows grazed half the day, and until October 17, when they returned to the shed, they were given grains, linseed cake, mangolds, straw and hay. From the 17th to the 25th of October the linseed cake was replaced by sunflower cake, and from the 25th to the 31st crushed barley was substituted for concentrated food.

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(1) See No. 298, *B.* March 1913. (*Ed.*).

The daily variations in the milk content of each milking (morning, noon and evening), and the variation in the content of each day's milk (the aritmetical mean of the milk of the morning, noon and evening milking) are given in tables. If the results of the different months are compared, it is seen that the greatest variations in the content occurred in the two months March and July, when there was no change in the rations. While in March 18.9 per cent. of the single milkings and 3,3 per cent. of the daily milkings showed a variation in fat content of from 0.2 to 0.45 per cent., in Jult 34.4 per cent. of the former and 23.3 per cent. of the latter showed variations of the same amounts. The greatest variations in fat content were in July, when they reached 0.7 and 0.35 per cent. for single milkings and the day's milk respectively: in March, the highest variations were 0.45 and 0.16 per cent, respectively. In May, the highest variation in the fat content of the single milkings was 0.7 per cent, and that in the days' milk 0.25 per cent. In October, the highest variation in the single milkings was found to be 0.5 per cent, and that in the day's milk 0.26 per cent.

The number of variations in the single milkings were: 17 in March, 27 in May, and 31 in July and October respectively. The greatest variations in fat content in the day's milk occurred in July (during the full grazing season). Next come October and May (when the rations were varied). The day's milk showed least variation in fat content in March (when the rations were always similar).

In glancing over the variations in specific gravity, the similarity of the returns for March and October (when the cows were mostly stall-fed) and those for May and July (when the cows were mostly at grass) is very striking. In March and October, 10 per cent. of all the single milkings varied in specific gravity more than 1 lactodensimeter degree in 24 hours (highest variation 1.9 degree). In May and July, the number of single milkings which attained this amount of variation (highest variation 3.7 degrees) reached 33.3 and 31.1 per cent respectively. In spite of these numerous and large variations in the single milkings, the fat content of the daily milk showed a considerable adjustment of the differences.

The greatest daily variation of specific gravity was in July (0.0037), the smallest in October (0.0015). In March and May the variations did not exceed 0.002. The highest variations which occurred on change of rations were on an average:

Periods	Variations in fat content	Variations in specific gravity (lacto densimeter degrees
—	—	—
May 4-7.	0.45	1 2
Oct. 6-8.	0.30	0 8
Oct. 17-19	0.25	1.0
Oct. 25-27	0.50	1.1

It is thus evident that the variations in fat content and specific gravity were not much greater when the rations were changed. The writer concludes that the current idea that the variations in fat content of the milk of a large herd fed on approximately similar rations are small, is a fallacy, and that in testing for adulteration, as much stress must be laid upon alterations in the specific gravity of the milk as upon the variation in the fat content.

The writer does not consider that fat content variations of 0.2 per cent, and even up to 0.3 or 0.4 per cent, are alone sufficient to prove adulteration, but they must be accompanied by a difference of 0.002 or more in specific gravity. In passing judgment upon milk from the examination of a sample taken in the shed, the alteration in the specific gravity is the chief point to be noticed. Repeated fat determinations constitute the sole method of judging milk from the butter-making point of view.

1181 - **The Possibility of Increasing, with Economic Advantage, the Average Fat Content of Cow's Milk.** — HANSSON, NILS in *Kungl Landtbruks- Akademiens Handlingar och Tidskrift*, Year 52, No 5, p 289. Stockholm, 1913

Among the components of milk, fat is the most valuable, both when milk is sold as such and when it is used for butter or cheese making ; thus the eco-

Schematic diagram showing the composition of the dry matter of milk for different fat contents (as abscissae)

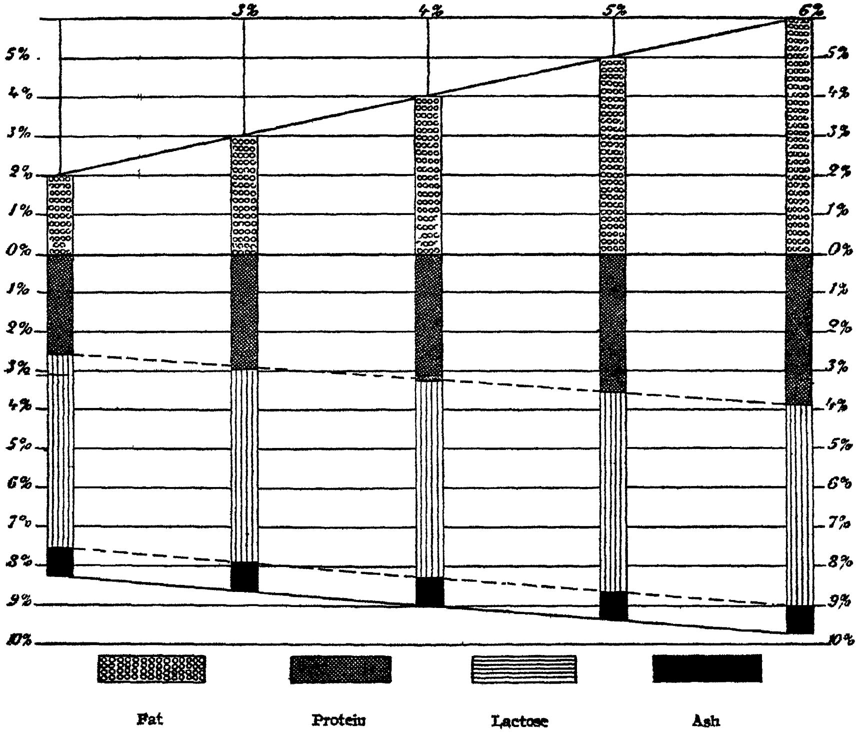

TABLE I. — *Average composition of the dry matter in milk.*

Fat in milk	Solids not fat in milk	Total solids in milk	Fat in the total solids	Solids not fat for 100 lbs of fat
%	%	%	%	lbs.
2.00	8.31	10.31	19.4	415
2.25	8.46	10.71	21.0	376
2.50	8.51	11.01	22.7	341
2.75	8.57	11.32	24.3	312
3.00	8.72	11.72	25.6	291
3.25	8.83	12.08	26.9	272
3.50	8.96	12.46	28.1	256
3.75	9.05	12.80	29.3	241
4.00	9.16	13.16	30.4	229
4.25	9.29	13.54	31.4	218
4.50	9.30	13.80	32.6	207
4.75	9.30	14.05	33.8	196
5.00	9.33	14.33	34.9	187
5.25	9.37	14.62	35.9	179
5.50	9.36	14.86	37.0	170
5.75	9.34	15.09	38.1	162
6.00	9.31	15.31	39.2	155

nomic importance of producing cheaply a milk rich in fat will be perceived at once.

Without waiting for the theoretical solution of the problem, for the last quarter of a century attempts have been made in Sweden to resolve it in practice. The writer, who is chief of the Animal Husbandry Section of the Central Agricultural Experiment Station of Sweden, discusses in this paper the circumstances which exert an influence on the results, and gives a résumé of what has been obtained up to the present.

In comparing the numerous analyses of milk that have been made in the course of feeding experiments carried out during 13 years at Bonn with those that were made at Tranekjaer and Bregentved in Denmark, the writer found that the composition of the dry matter in milk varies very regularly with its fat content, independently of the breed of cow, of the time elapsed

TABLE II. — *Food required to produce milk richer or poorer in fat, calculated according to the composition of the milk. Average yearly production* 3 300 *kg.* (6600 *lbs.*) *of milk per cow. Live weight* 450 *kg.* (990 *lbs.*).

Fat content of milk %	Food requirement of cow per year — Food units	Food requirements for the production of				
		1 kg. of fat — Food units	100 kg. of milk — Food units	1 kg. of dry matter of the milk		
				Ration of production — Food units	Ration of upkeep — Food units	Total — Food units
2.50	1 909.0	25.5	63.6	2.46	3.32	5.78
2.75	1 955.9	23.7	65.2	—	—	—
3.00	2 002.0	22.2	66.7	2.58	3.11	5.69
3.25	2 048.7	21.0	68.3	—	—	—
3.50	2 095.0	20.0	69.8	2.68	2.93	5.61
3.75	2 145.5	19.0	71.4	—	—	—
4.00	2 188.0	18.2	72.9	2.77	2.77	5.54
4.25	2 234.5	17.5	74.5	—	—	—
4.50	2 281.7	16.9	76.1	2.86	2.65	5.51
4.75	2 329.1	16.3	77.6	—	—	—
5.00	2 376.4	15.8	79.2	2.98	2.55	5.53
5.25	2 423.3	15.4	80.8	—	—	—
5.50	2 471.0	15.9	82.4	3.09	2.46	5.55

since calving, and of the feeding. This is shown by the accompanying diagram and by the figures of Table I, which give the composition of the total solids in milk, and according to which the solids not fat increase with the fat content, but to a lesser extent.

This increase concerns almost exclusively the protein content, which is about one-quarter of the total solids; it does not affect either the lactose or the ash, the quantities of which, according to the analyses used, are almost always constant relatively to the quantity of milk, namely about 5 per cent. of lactose, and 0.7 per cent of ash.

This signifies that the richer a milk is, the less does the production of solids not fat influence the production of fat.

Taking these ratios of the components of milk as a basis, the influence of the fat content of the milk on the food requirements of the cow has been calculated.

TABLE III. — *Consumption of food for the production of 1 kg. of fat.*

Average fat content of milk of the herds %	Food units per 1 kg. of fat	
	Southern province: Malmöhus	Central provinces
2.80 — 2.89	(25.6)	—
2.90 — 2.99	23.4	—
3.00 — 3.09	22.4	—
3.10 — 3.19	21.5	21.5
3.20 — 3.29	21.1	20.8
3.30 — 3.39	20.5	20.1
3.40 — 3.49	20.4	19.7
3.50 — 3.59	19.8	19.3
3.60 — 3.69	19.9	18.7
3.70 — 3.79	18.0	18.5
3.80 — 3.89	17.8	18.4

According to the standard of feeding of cows established by the writer on the basis of the results obtained by the milk control societies, cows require one food unit for the production of 6.6 lbs. of milk. Supposing this standard refers to the production of a milk containing 3.5 per cent. of fat, the food required for the production of milk having another fat content has been calculated by valuing the proteins and lactose as fat according to their calorific value and supposing, with Kellner, that 0.55 lb. of fat corresponds to 2.2 lbs. of starch value (= 1.65 Swedish food units). The result of this calculation (see Table II) is that for the production of 2.2 lbs. of fat the food requirements of the cow diminish, but following a decreasing ratio, with the increase of the fat content of the milk. For the production of 220 lbs. of milk, this requirement increases following a continuous ratio of about 1.5 food units for 0.25 per cent. of the increase of fat content.

This increase of consumption of fodder does not seem to be connected with the quantity of total solids. On the contrary this ratio is almost constant, for if the quantity of fodder required for the production of a certain quantity of solid be divided into its two parts (ration for upkeep and ration for production), it will be found that the increasing amount of fodder required for production, which depends upon the greater calorific value of the fat compared with that of the other components of milk, is balanced by the decreasing quantity required for upkeep distributed over the total solids produced.

This theoretical deduction is further checked by an investigation on the results of the milk control societies. This investigation was made with the object of showing the difference in the consumption of fodder for the production both of 1 kg. of fat and of 100 kg. of milk of varying richness. Table III, which gives the figures for the controlled herds of the most southern province and those of the three central provinces in separate columns, shows the consumption of fodder separately for each herd.

The results are grouped according to the average fat content of the milk.

These figures for 2.75 to 3.75 per cent. of fat correspond as well with those of Table II as among themselves, especially if it be considered that the figures of Table II are calculated for cows weighing 450 kg. (990 lbs.) and yielding exactly 3000 kg. (6600 lbs.) of milk, whilst the figures of Table III refer to cows of varying weights and yields. In this table the figures for the classes of the poorest and of the richest milk are based on so small a number of cows as to have very little value.

The practical results of the control societies thus show, by their agreement with the theoretical deductions, that fat may be produced with a much smaller consumption of fodder in rich milk than in the poorer milk. If the fat content is increased from 3 to 4 per cent., the consumption of food per kg. of fat is reduced by 4 to 4.5 units, that is by about 1.8 per cent. of the quantity of food necessary for the same production in milk containing 3 per cent. of fat. The very small diminution of solids not fat relatively to the quantity of fat which thus results from the increase of the fat, has next to no importance economically owing to the low value of these components.

An increase in the fat content of milk leads to considerable profit in places where milk is used for the manufacture of butter or where it is paid for according to its real value. But for the very frequent cases in which the price of milk is fixed independently of its fat content, it becomes important to know if the production of fat milk requires more fodder than that of poor milk. In order to resolve this question, the writer compared groups of cows yielding milk of different fat content; he has arrived at the results that the consumption of forage per kg. of milk grows proportionally to the fat content. The calculation of this ratio has yielded somewhat variable results, but it may be admitted as an average that an increase of 1 per cent. of fat corresponds to an increase of 6.3 food units for the production of 100 kg. of milk, which agrees with the figures of Table II. For a butter which is paid 2 kroner per kg. (1s a lb.) this increase of 1 per cent. of fat in 100 kg. of milk is worth nearly 2.2 kr. (2*s* 5*d*), but 6.3 food units are worth less than 0.7 kr. (9 ¼*d*). It is thus proved that the greater value of the food required for the production of a richer milk does not exceed about 30 per cent. of that of the fat content of the milk. It is thus advantageous to produce a rich milk if it is paid according to its real value. Of course this is not the case when the increase in the fat content of the milk is obtained at the expense of the average quantity of milk, because it is especially upon this that the cost of the production of milk depends.

After having thus treated of the advantage of an increase in the fat content of milk, the writer reviews the means to be adopted to obtain it and the progress which has been hitherto achieved in Sweden. It has been proved, he says, that certain kinds of food, such as palm and coprah cakes and the leaves of beets, have a tendency to increase the fat content of the milk produced, whilst others, such as poppy and German sesame cakes and inferior rice flour, act in the opposite way. Nevertheless it is not by feeding that sure progress is to be expected, but by selection in breeding with this object in view.

This truth has long been recognized in Sweden, but even now the progress has been in general but slight, whilst in Denmark it is very marked. The writer nevertheless mentions some Swedish herds in which a decided progress has been noted during recent years, as is proved by the checked figures of the breeding centre competitions (1). One herd especially, that of Alberga, of Ayrshires, gives a good example and unassailable proofs of the manner in which this progress has been realized.

The writer mentions the Kolle-Kolle herd in Denmark as a famous example of the influence that a bull may have by the capacity of transmitting to the female line a high productiveness of milk rich in fat. The next gives a list of the bulls most employed for the development of the East Friesian breed in Sweden, with notes on the production of milk and of fat in the daughters of these bulls as compared with the production of their dams. He demonstrates that most of these bulls have transmitted to their daughters a productiveness greater than that possessed by their dams. On the other hand some of them have exercised a contrary influence upon the qualities of their descendants.

In order to demonstrate the practical possibility of increasing the production of butter fat by means of the selection of the breeding animals, the writer gives a summary of the development of the Alberga herd and of the choice of the bulls that were used. Thanks to the determinations of the quantity of milk and of its fat content made regularly since 1894 for all the cows of the herd, it has been possible to calculate separately the production of milk and of fat for the groups of descendants of each bull and of each cow.

As for the bulls, five have had a remarkable influence on the development of the herd. If the cows are distributed in families according to the bulls that were their sires, or paternal grandsires, a great difference in the average quantities of milk and butter fat of the different families will be seen. But in order to establish with certainty the influence of each bull upon his offspring, it would be necessary to compare separately the production of each of his daughters with that of their mother, making such comparison at the same age, that is to say for the lactation periods following the first second, third, etc., calving. In this manner the influence of the normal increase of production during the first lactation periods would be eliminated.

This comparison has been possible for only two of the Alberga bulls. For the other three bulls only the average figures for all the years of production of their daughters and of the dams of these were available.

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(1) For the definition of the breeding centre competitions in Sweden, see Dr. ARENANDER's original article: « The Development of Cattle Breeding in Sweden »; page 1502 of this *Bulletin* (*Ed.*).

TABLE IV.

Names of bulls	Number of daughters	Controlled during years	Sum of years of control	Average yields		
				Milk kg.	Fat %	Fat kg.
Bill.						
Daughters	61	5.92	361.12	2 545.1	3.70	94.17
Mothers	61	3.59	218.99	2 347.3	3.59	84.31
				+ 197.8	+ 0.11	+ 9.86
Malte.						
Daughters	69	3.78	260.82	2 863.6	3.78	108.31
Mothers	69	3.61	249.09	2 535.1	3.61	91.64
				+ 328.5	+ 0.17	+ 16 67
Farmer's Joy						
Daughters	26	4.54	118.04	2 811.0	4.01	112.76
Mothers	26	3.70	96.20	2 537.1	3.70	93.92
				+ 273.9	+ 0.31	+ 18.84
Res.						
Daughters	11	—	37	3 470.1	3.90	135.35
Mothers	11	—	37	2 780.5	3 72	103.47
				+ 689.6	+ 0.18	+ 31.88
King V.						
Daughters	15	—	30	2 672.6	4.30	115.01
Mothers	15	—	30	2 914.2	3.90	113.58
				— 241.6	+ 0.40	+ 1.43

These results of the comparison are shown by the figures of Table IV which give the increase (+) or the decrease (—) of the production of the cows of each family compared to those of their dams.

The five bulls have all of them caused an increase of the fat content of the milk. and four of them have also caused an increase in the quantity of milk produced, but from this point of view the fifth has caused such a decrease that the progress in the production of fat has been almost nil.

Nevertheless, in order to be just in the verdict on the value of a bull for breeding purposes, the productiveness of the cows with which he is mated must be observed. The higher this was, the more difficult it became for the bull to raise it still higher. The writer has illustrated this fact by grouping the dams of each family of a bull according to the fat content of their milk. From this grouping it appears that the poorer the milk of the dams, the more could all the bulls cause the fat contents to rise. In the groups in which the milk was richest two of the bulls have caused the fat content to sink. A bull may thus act favourably on the average fat content of one herd and exert an unfavourable aotion in another herd in which the faculty of yielding a rich milk is more developed.

Calculating the average fat content of the milk of all the descendants of a bull, the writer has determined the fat content that this bull represents and which he can transmit as inheritance. He calls it " genotype fat content percentage " of the bull.

The writer summarizes as follows the results of his investigations on the influence that the choice of the bulls has on the fat content of the milk:

1. It is possible to increase the percentage of fat content of the milk of a herd, with economic advantage, by a judicious selection of the breeding animals.

2. By dividing a herd into families of descendants of the sires and of the dams, the influence of each animal on the development of the qualities of the herd may be better demonstrated.

3. The influence of the males is demonstrated by the average production of all their female descendants, or still better by a comparison of the average production of their daughters with that of the dams of these daughters when they were of the same age.

4. The influence of the bulls on the percenrage of fat content of the milk of their female descendants depends upon the qualities of the females of the preceding generations.

5. The influence of the cows appears in the fact that a bull possessing a certain genotype percentage of fat cannot increase the percentage of fat in the milk except in the daughters of cows inferior to him in the percentage of fat content, whilst the daughters of the same bull out of cows yielding richer milk will have a percentage of fat inferior to that of their dams.

6. The males and the females transmit to their descendants the percentage of fat which they themselves have inherited from their ancestors, the male and the female having, as it appears, an equal influence on condition that they represent the same constancy of results in this respect. But owing to its larger number of descendants, the male has a greater influence on the development of the herd.

7. Nevertheless, as is usually the case in questions of heredity of quantitative characrers, variations are frequent, so that some particular animals may have an average fat content percentage very different from that of the sire or of the dam; but the average percentage of all the descendants is in general very near to the average genotype percentage of fat of the sire and of the average fat content of the dam's milk.

8. For the improvement of animals, as well as for that of plants, it must be sought to unite the qualities having the greatest practical value; every effort towards the attainment of such a high yield of milk as would be

injurious to the health of the animals must be carefully avoided, as well as record figures in the butter fat content. But everywhere where milk is paid according to its quality, the object in view should be to combine the efforts in these two directions in order to attain a high production of butter fat.

9. The principal means of increasing the fat content of the milk is a scrupulous selection of the breeding animals, especially of the bulls, judging the genotype percentage of butter fat according to : *a*) the average percentage of the milk of their dams, grandams and sisters ; *b*) the influence of their sires and grandsires on their daughters; and, when the bulls are sufficiently old, *c*) their own influence on the average per centage of butter fat in the milk of their female descendants.

1182 - **The Improvement in Sheep-Breeding in Algeria.** — COUSTON, F. in *La Revue des Colons de l'Afrique du Nord*, Year 2, No. 31, pp, 488-490. Algiers, July 31, 1913.

The official statistics give a total of 9 million sheep for Algeria ; of these, one-fifth are found on the sea-coast and the Tell, and four-fifths in the Sahara and the semi-arid plateau steppes. Efforts for improvement must therefore necessarily be devoted to varieties of sheep adapted to the last-mentioned districts. Hitherto, the breed most used for improving the native sheep has been the Rambouillet, although Crau and Spanish Merinos are also imported. So far, no satisfactory results have been obtained. Merinos are not suited to the food and climatic conditions obtaining in Algeria. On the Government sheep-farms at Taadmit, Birin, Ben-Chicao and Moudjbeur, the Rambouillet Merinos die very soon after importation. Their lambs even do not live. The veterinaries and sheep-breeders are therefore of opinion that the Rambouillet sheep is unsuitable to Algeria. The writer has also little hopes of the greater success of the more resistant types such as the Spanish and Crau Merinos. They have shown themselves to have little adaptability, and have only yielded moderately satisfactory results when mated with the native breeds.

According to the writer, the Algerian sheep-breeding industry can only be improved rapidly and economically by means of a rigorous selection of the native breeds. Three of the latter are especially adapted to this end: the Zibran, Hodna and Ouled-Djellal sheep ; they are all hornless, stand 2ft. 8 in. high, and when full-grown give as much as 66 lbs. of mutton. In order to improve the breeds, the writer recommends the careful selection of the best rams, and their distribution by the State to the sheep-breeders.

1183 - **Fourth Egg-laying Competition in Tasmania.** — Profitable Egg-Production *The Agricultural Gazette of Tasmania*, Vol. XXI, No. 5, p. 184. Hobart, May 1913. POULTRY

The fourth egg-laying competition, held at Springvale, has recently finished, and it is interesting to note some of the chief features in this connection.

In 1909-10 a pen (6 fowls) of White Leghorns scored highest honours, with a total of 1248 eggs. In 1910-11 Black Orpingtons came to the fore with 1318 to their credit. In the two last competitions White Leghorns have topped the list with 1250 eggs in 1911-12, and for the season just finished 1272 eggs. The all-round average of the birds competing still improves.

Last year it was pointed out that a perusal of the lists of eggs showed that, as compared with previous competitions, there was no " falling away " in the number of eggs laid in respect to pens at the bottom of the list. In the first competition 28 pens competed, and five of these produced less than 800 eggs each. The second event saw the number of pens increase to 32, and six pens fell below 800 each. Last year the competition had 33 pens, and only two of these fell below 800 eggs. This year the three lowest pens recorded 943, 956 and 983 eggs respectively. This means that the lowest pen in the competition averaged over 157 eggs per bird.

Approaching the results arising from this year's work from another standpoint it will be seen that 19 pens out of the 29, or over 70 per cent., recorded more than 1200 eggs per pen, which means that each bird in the pens averaged over 200 eggs. (1). No meat was employed in the diet of the birds competing, but skim-milk and lucerne were provided to furnish protein. The following table shows the first three pen yields and the lowest three for the four competitions at Springvale :

Highest.

1st	year	1248,	1179,	1155;	total:	3582
2nd	»	1318,	1298,	1215;	»	3831
3rd	»	1250,	1201,	1188;	»	3639
4th	»	1272,	1261,	1261;	»	3794

Lowest.

1st	year	670,	654,	410;	total:	1734
2nd	»	661,	614,	614;	»	1889
3rd	»	801,	794,	632;	»	2227
4th	»	983,	956,	943;	»	2882

It is at the tail end where any improvement will be noticeable, and we find that the lowest pen yield in the 4th year more than doubled the number of eggs laid in the corresponding pen entered the first season.

1184 - **Ostrich Farming in Australia.** — HERBERT, T. J. in *The Agricultural Gazette of New South Wales*, Vol. XXIV, No. 6, pp. 511-521. Sydney, June 2, 1913.

Several shipments of ostriches have from time to time been imported into Australia. In 1873 the Melbourne Acclimatization Society imported some; and later, in 1881, Mr. W. Malcolm set about establishing ostrich farming in South Australia, and imported a number of birds. A farm was started at Gawler, and a large number of young ostriches were successfully hatched and reared.

About this time an Act was passed by the South Australian Government, with a view to encouraging the establishment of the industry, by offering the fee-simple of 5000 acres of land to the party who first placed 250 ostriches over one year old upon the land. Mr. Malcolm's venture was formed into a company (the South Australian Ostrich Company), which obtained 5000 acres near Port Augusta under these conditions.

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(1) The grand total of eggs laid by the 29 pens competing was 34137, or an average of 1177 eggs per pen, and as there were six birds per pen the average of each bird stands as high as 196 eggs. No substitution of birds was practised in this competition. (*Ed.*).

The country in the neighbourhood of Port Augusta, with an annual average rainfall of only 9 inches, must be classed as inferior pastoral land. Yet the birds have thriven, and a flock of 700 is now pasturing on the farm without any artificial feeding except during the first few months of their lives when they are fed on lucerne and bran. One and a half acres of lucerne are grown and watered from the town water supply. The farm is greatly handicapped by not being able to produce more green fodder; otherwise a greater number of chicks could be reared. The improvevement in the plumage brought about by feeding lucerne was strikingly shown when eight birds were sent to Melrose, about 40 miles distant, where they were grazed in a lucerne paddock. The feathers were clipped and sold to a Melbourne manufacturer, realizing £7 per clip per head, or more than double the amount realized from the same birds when grazed on the scantily grassed paddocks at Port Augusta. Birds from the Port Augusta farm have been the origin of almost all the ostriches now pasturing on the various farms throughout the Commonwealth.

In South Australia itself there exists another flock of 400 birds, running on a station near Lake Alexandrina, the nucleus of which came from Port Augusta.

In New South Wales there is a flock of 100 head at South Head, near Sydney, which thrives well, but whose further expansion is limited by lack of space. At Hawkesbury Agricultural College a second flock has been developed from a single pair acquired in 1900, and produces feathers of very high quality.

Another flock was started at Nardoo, near Coonamble, in 1905, with pairs of birds from the South Australian Ostrich Company; the birds now number 550 and it is proposed to increase them still further; 2500 acres are devoted to their use, and the owner of the flock, who also has a 5000 - acre sheep run, intimates that he receives greater net profits from the ostriches than from the sheep, though no birds have yet been sold. An artesian well provides abundance of water, and 30 to 40 acres are under lucerne, yielding a cut about every six weeks in summer; this is grown more as a measure of precaution against possible drought than from absolute necessity, for, so far as present experience goes, hand feeding is rarely required. The hay is stored and when fed is chaffed, damped, and mixed with bran or maize. It is estimated that the land will carry 1 bird (or 3 sheep) to every 6 acres, running on natural pasture alone. It will probably prove more profitable to grow fodder, as this would not only increase the carrying capacity of the land, but also raise the quality of the feathers.

The writer has an ostrich farm on the Yanco Irrigation Area; its area is 408 acres, of which 108 are irrigable and destined to lucerne. The flock was built up from birds from the South Australia Co., and at present numbers 90 birds ; last year 12 Soudanese ostriches were imported from North Africa to be mated with the South Australian strain.

A flock of 24 adult birds, the progeny of the Hawkesbury College stock, has also been taken to Qeensland, where attention is now being paid to the subject of ostrich raising.

BEES

1185 - **Further Report on the Isle of Wight Bee Disease.** — *Supplement No. 10 to the Journal of the Board of Agriculture.* London, July 1913.

This supplement contains a detailed account of the progress of the investigation into the cause of the Isle of Wight Bee Disease. The latter is attended by certain symptoms, such as inability to fly, the presence of numerous bees on the ground in front of the hives, and the dwindling of stocks; many other symptoms have however been recorded, and no one of these is characteristic of the disease. The only essential feature is the death of large numbers of bees, and often of the whole stock, especially during the wet and cold periods of the year, or during the winter months. The disease is probably endemic, but owing to lack of information, it probably often passes unnoticed in mild seasons, the loss of bees being attributed to cold, starvation, spring dwindling, etc.

During the years 1911 and 1912, *Nosema apis* in some stage has been found in almost every stock apparently suffering from the Isle of Wight disease which has been examined, and, moreover, no bacteria other than those found in normal bees have been detected. It can therefore be stated with confidence that *Nosema apis* is the agent responsible for most of the outbreaks in which the symptoms of the Isle of Wight diesease have been noticed, or in which the stocks have dwindled or died without apparent cause.

OTHER LIVE STOCK

1186 - **Domesticated Reindeer in Newfoundland.** — *The Field*, Vol CXXI, No 3157 (Supplement). London, June 28, 1913.

Dr. Grenfell, the famous Labrador missionary, has been using reindeer teams for hauling his *kometiks* (sleds) in the various trips he has made from his headquarters at St. Anthony along the coast of northern Newfoundland during the past winter. He speaks most enthusiastically of the reindeer experiment, which has appealed so strongly to the Canadian authorities that the Dominion Department of the Interior purchased 40 of these animals last summer for its own use. They were transported from Newfoundland to Edmonton and thence to the Mackenzie delta to be used by the mounted police for drawing teams in winter, so as to prevent a repetition of the tragedy which attended the effort of Inspector Fitzgerald's patrol to cross the frozen wastes during the winter of 1910-1911.

In the northern part of Newfoundland there are very few horses and dogs for haulage purposes. The same is true of Labrador, where the conditions are even worse, as the Labrador dogs are vicious brutes which attack and devour even human beings. Dr. Grenfell took up the reindeer experiment with the idea of inducing the people to substitute reindeer for dogs as soon as he could supply them with sufficient of the former. Reindeer are also useful in providing milk, which is much needed for the children ; as they propagate very rapidly, it is believed that it will be possible in a few years to kill them for food purposes, and thus help to supply the domestic market.

The original herd, consisting of 300 Lapland reindeer, was imported by Dr. Grenfell about five years ago, with a fund of $ 15 000 raised partly in America, and partly in England, with $ 5 000 contributed by the Canadian Government. This herd has increased naturally and now numbers over 1 200 head. One reindeer will do more work than six of the dogs formerly used.

Dr. Grenfell adopted the idea of introducing reindeer into Labrador from the late Dr. Sheldon Jackson, who introduced them into Alaska twenty years ago. The latter, in spite of many difficulties, succeeded in obtaining a certain number of these animals, which by successive additions and natural increase now amount in number to 15 000. The world received an object lesson in 1896 when a number of whaling ships were frozen fast within the Arctic circle and a herd of 500 reindeer were driven 700 miles to supply them with food.

Reindeer can be used as saddle and as pack animals ; they can take 150 to 200 lbs. on their backs. Harnessed to a sled, two of them will pull 500 to 700 lbs. thirty miles daily. Kellman drove his reindeeer express on one occasion 95 miles in one day. At present the most northerly mail route in the world, that between Kotzebue and Barrow, Alaska, a distance of 650 miles, is served by reindeer. No food need be carried for them, as at the end of each day's journey they are unharnessed and at once dig through the snow with their powerful hoofs to the white moss below, which serves them as food.

When Dr. Grenfell began his experiments in Newfoundland, he was fortunate enough to secure the services of Capt. W. C. Lindsay, a retired British Army officer. The latter took over the control of the herd of reindeer, and under his skilful and capable management even better results have been achieved than by the American Government in Alaska. The percentage of living fawns from the Alaskan deer, as given in the Government records, is 40 per cent., whereas at St. Anthony it is nearly 100 per cent. The only trouble that is found at St. Anthony is that the dogs sometimes attack the deer, and the latter in running away over the rough ground often break their legs and have to be killed.

An endeavour was made in the summer of last year to secure a number of young wild caribou to cross with the reindeer, but owing to the plague of flies, which was unusually bad, the idea had to be given up. It is hoped that there will be greater success this year.

The reindeer wandered considerably more last winter than the preceding one ; this was due, in the opinion of the Laplanders, to the fact that the animals have learnt that there are no wolves in the country to fear.

After another season, it is proposed to break up the present large herd, and distribute it among the Mission Stations in Labrador, where, after the process of reproduction has continued for some time longer, the Alaskan practice of lending small herds to the natives to enable them to replace the dogs will probably be adopted.

FARM ENGINEERING.

AGRICULTURAL MACHINERY AND IMPLEMENTS

1187 - **Motor Plough Competition at Königsberg.** — MARTINY in *Maschinentechnische Rundschau*, No. 2, pp. 6-9. Königsberg, July 1913.

The Chamber of Agriculture for the province of East Prussia at Königsberg organized a motor plough trial in a field at Löwenhagen near Königsberg on June 4, 1913.

The following motor-ploughs were presented:

The " Ihace " : 45 to 60 H. P.; it weighs, with ploughing tackle, 10 tons 16 cwt., and costs £ 1127.

The " Podeus " : 65 H. P., weighs, with five-share balance plough, 8 tons 7 cwt., and costs £ 1078.

The " Pöhl " 70 H. P.; it weighs, with plough, 5 tous, and costs £ 833.

The " Arator " : 50 H. P.; weighs, with plough, about 5 tons, and costs £ 882.

The "Ergomobil": 30 to 35 H. P.; weighs, with plough, 9 tons 7 cwt., and costs £ 1054.

The " Stock " : this costs without reversing gear £ 833 ; with it £ 882.

The " Wede " : 56 H. P.; weighs 5 tons and costs £ 933.

The " Komnick " : costs about £ 980, and weighs about 4 tons 5 cwt.

Both the soil and the weather were favourable to the trials. For the shallow ploughing a two-year-old pastured clover ley on mild loam was chosen. For the deeper work, a field dry on the surface and sufficiently moist underneath was used.

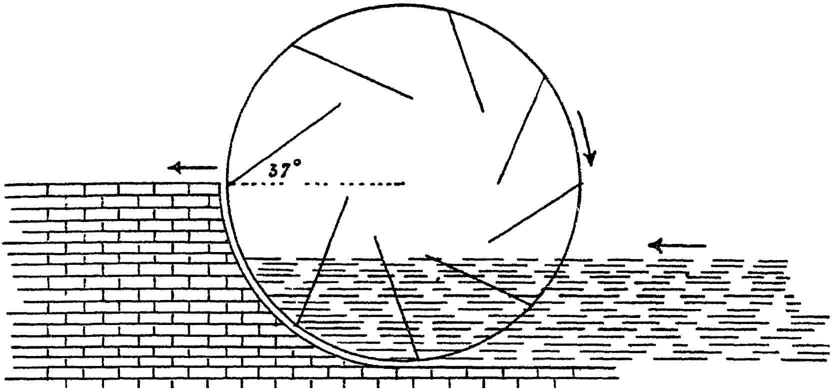
The motor ploughs, thanks to the very favourable soil conditions, worked well. As for the amount of work done, only a few trial tests were made for some of the machines. The results are given in the following table:

Motor plough	Quality of soil	Depth of work	Breadth of work		Speed per second	Area ploughed per hour
		inches	ft.	in.	feet	acres
Ihace	Medium soil	9 ½	7	9	2.85	1.36
Arator	»	—	6	7	3.94	1.54
Stock	»	8	6	7	4.26	1.73
Wede	»	8	5	»	3.11	1.11
»	»	9 ½	5	»	2.98	1.11
»	Heavy clay soil in good conditon of moisture.	9 ¾	5	»	3.60	1.30

Lastly the writer discusses the quality of the work performed by each motor plough.

1188 - **An Egyptian Water-lift.** — PARR, A. E. in *The Agricultural Journal of India*, Vol VIII, Part III, pp. 293-294. Calcutta, July 1913.

"A very useful water-lift for low-lift canal irrigation has recently been received from Egypt. It consists of two circular pieces of iron on an axis about 15 inches apart. These two wheels are connected together by a number of vanes set on at an angle of about 37° to the radius, as in the accompanying drawing The whole thing revolves in a close-fitting masonry basin. It is geared to run at a slow speed and may be worked by one bullock. The wheel discharges the water at the height of its own axis." The writer recommends it as the best machine he has tried for low lift irrigation.



1189 - **Automatic Drinking Trough** (1) **for Pigs.** — THALLMAYER, V. in *Wiener Landwirtschaftliche Zeitung*, Year 63, No 56, p. 647. Vienna, July 12, 1913.

Automatic drinking troughs for pigs are frequently used, especially in America. A simple form of such a trough is the one shown in the accompanying figure. The trough (T) is provided with a cover (D) under which a float (S) is situated. The lever (H) connects the float with the valve (V). When the trough is used the float sinks and by means of the lever pushes the valve open so that the water from the tank or water-pipe (B) can flow into the trough, through the pipe (R); (mn) is a flange.

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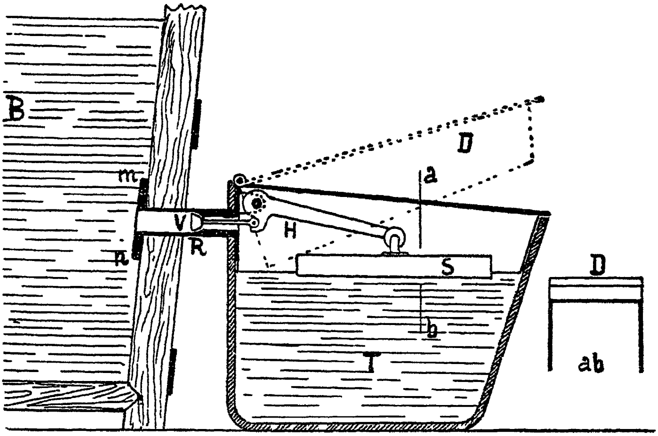
(1) See No. 575, *B*. May 1913. (*Ed.*).

To the right is a section through the cover along the line (ab). The cover (D) is necessary to prevent the animals touching, the float and attached parts with their snouts.



Automatic drinking trough for pigs. Vertical section.

1190 - **A New Apparatus and Method for Milk Sterilization.** — LOBECH, O. in *Molkerei-Zeitung*, Year 27, No. 57, pp. 1105-1106. Hildesheim, July 25, 1913.

As an appendix to an article which has been already mentioned (1), the writer gives a detailed description and diagrams of a complete plant for carrying out the new " Biorisator-Process ".

The principal part of the " Biorisator " apparatus is the so-called " Biorisator " sterilizer. This consists in the main of two cylindrical receptacles placed one within the other. In the inner the milk is reduced to a fine spray. In the space between the two cylinders, the milk is heated. Steam is conducted along a pipe at the side, in order to obtain the necessary heat for the inner cavity, and for the sterilization process. As secondary apparatus may be mentioned a forcing pump, a compressor and a cooler.

The method of working is as follows (see Plate) : The milk in the collector (*a*) is drawn through the pipe (*i*) by means of the forcing pump (*b*) and conveyed by (*k*) to the compressor (*c*). The manometer (*m*) registers the amount of pressure, and the regulator (*d*) carries back by the pipe (*l*) any superfluous milk. The milk is conveyed by the pipe (*o*) from the compressor to the biorisator and issues through fine orifices into the interior of the latter. After having been reduced to spray, the milk flows from the biorisator (*e*) through the pipes (*r*) to the cooler (*f*) and is here cooled as soon as possible down to at least 10° C (50° F.). It then leaves the cooler by

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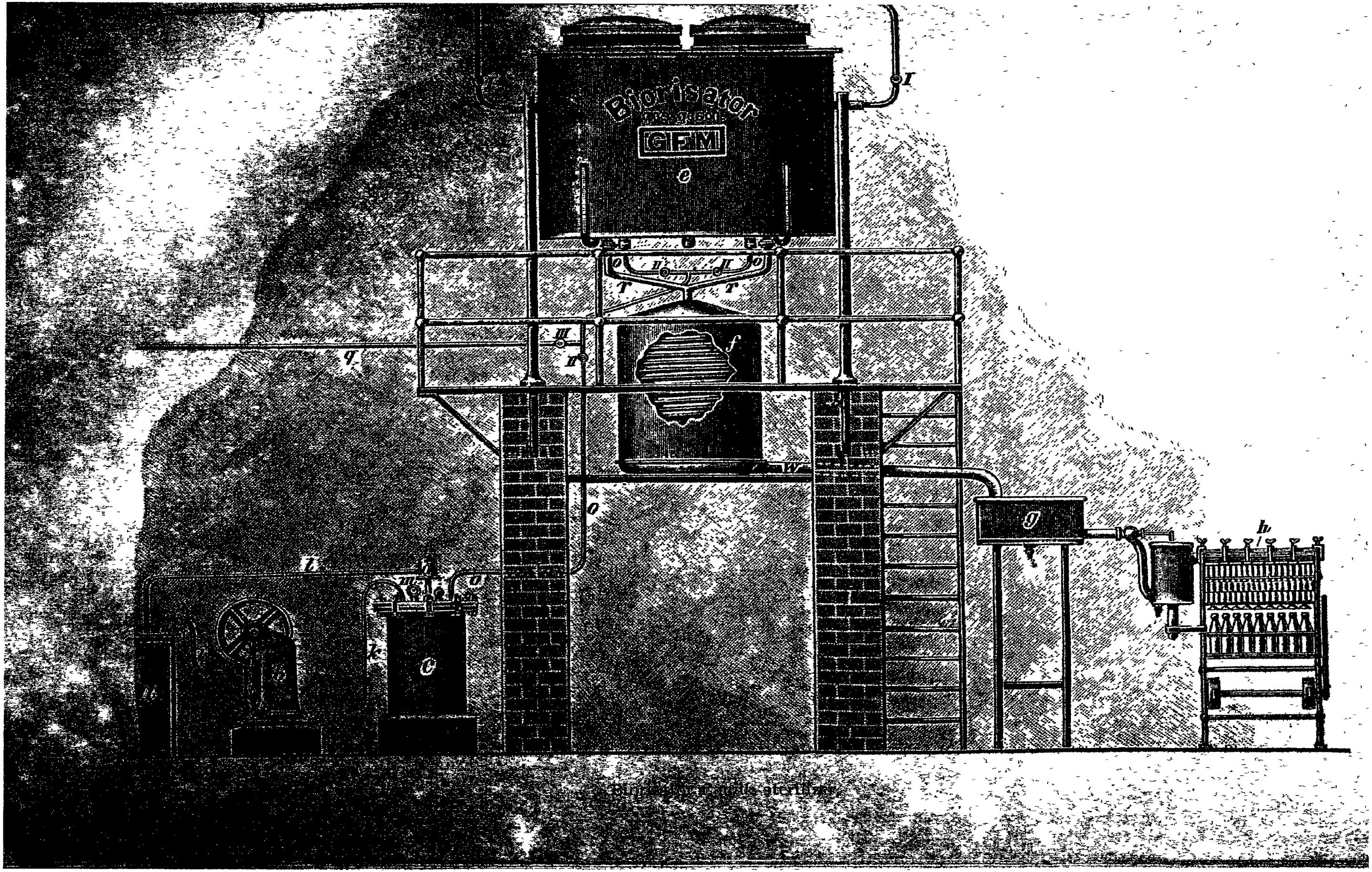
(1) See No. 743, *B*. June 1913. (*Ed.*).



Biorisator [illegible] sterilizer

the pipe (*w*) and flows to the tank (*g*). From here it runs to the bottle-filling machine (*h*), where it is immediately put into bottles.

Before the milk is sterilized, the whole plant is cleaned, either by pumping water through it, or preferably by allowing the water to flow through the supply pipe (*q*) into the biorisator, after closing the milk valve (II) and opening the water valve (III). The necessary heat is obtained by opening the steam valve (I) at the same time. The very hot water flows through the whole plant and sterilizes it. After about 10 minutes, the cooler (*f*) is attached and the water-valve (III) is opened; all the water is drawn off, the temperature is raised to about 75° C. (167° F.) (the heat required for sterilizing the milk), the pump is set going and the milk valve (II) is opened. The apparatus can now work for hours without stopping and only needs occasional attention.

The product obtained by the Biorisator Process is a pure milk, free from bacteria, with the characteristics of raw milk; it is especially suitable for infants. It is also possible to obtain excellent dairy products from this milk, which can be treated just like raw milk.

It was also observed in the dairy that there was no evaporation from the milk, and consequently no decrease in its amount.

RURAL ECONOMICS.

RURAL ECONOMICS

1191 - **Systems of Land Tenure Prevalent in the Plain Belt of the Province of Treviso, Italy.** — SACCHI, G. in *L'Agricoltura Italiana*, Year 39, Part 749. Pisa, August 31, 1912.

This is a short study of the commonest forms of land tenure in the plain belt of the Province of Treviso, Italy, which shows how in the same regions there are farms worked by the owners, farms leased and farms held on the share system (metairie). The least frequent form is farming by the owner himself, because, though the estates are prevailingly large or medium sized, the economic unit is the individual farm, varying in extent from 5 to 15 acres. The lands that are managed directly by their owners or their agents are thus either the large estates, and chiefly portions of these that are not divided into farms, or the small holdings of peasant proprietors. The latter are not numerous, but they tend to increase.

The rent is paid partly in cash and partly in kind: that of the arable portion of the farm is given in cash or in kind corresponding to a fixed sum, while the rent of the vineyards and mulberry plantations is paid by half of the produce in kind. Frequently a certain number of days' labour or royalties in kind are included in the rent. This form of leasing prevails on the right of the Piave. The lease is tacitly renewed every year until either of the parties gives notice to the other between March and the 11th of November. Only the farms belonging to charitable foundations are leased, mostly for periods of nine years, for cash only. Metairie, or the half-share system, though not always so simple as in

Tuscany, prevails on the left of the Piave, where the natural fertility of the soil and the just proportion between the available hands and the extent of the farms have been powerful coefficients in the success of this system of tenure, which has led to an advantageous ratio of arable land to plantations of vines, mulberries, etc.

The owner of the land supplies the necessary capital in live stock, he pays one half of the various expenses of production (save labour), the whole of the taxes, and all the cost of new plantations of trees and vines. The expenses caused by the control of fungus pests, as well as the cost of props and wire for the vines, are defrayed in equal shares by the owner and the farmer. The latter, on his side, generally brings into the farm the commonest machines and implements, he provides all the labour and pays house rent, besides giving the owner some royalties in kind and occasionally some days' work and doing some carting for him, especially when the latter manages by himself some small portion of the estate.

The rotation and manuring to be used are determined by the owner. The contract is indefinite and it may come to an end any November provided the necessary notice has been given in the previous March.

1192 - **Persons engaged in Agriculture in Prussia according to the Census of June 12, 1907.** — HAGMANN in *Mitteilungen der Deutschen Landwirtschaftsgesellschaft*, Year XXVIII, Part 34, pp. 483-486. Berlin, August 25, 1913.

For the first time, in 1907, the numbers of persons engaged in agriculture have been registered in the returns of professions and exploitations. The comprehensive results of this census are given in Vol. 212, *2b* of the Statistics of the German Empire, which has recently appeared. Table I gives the numbers of persons engaged in agriculture divided into five classes according to the sizes of the farms.

TABLE I. — *Persons engaged in agriculture.*

Classes according to size	Men	Women	Total	On 100 acres productive area
Under 5 acres. . . .	747 559	1 846 911	2 594 470	105.0
Between 5 and 12 ½ acres	673 416	824 383	1 497 799	35.5
» 12 ½ » 50 »	1 273 995	1 244 343	2 518 338	17.5
» 50 » 250 »	754 476	620 171	1 374 647	8.5
Over 250	602 992	432 278	1 035 270	7.0
For the total area	4 052 438	4 968 086	9 020 524	17.4

TABLE II.

Classes of farms according to size	Managers of farms	Members of family engaged		Hired labour			Temporarily engaged
		Permanently	Temporarily	Foremen and accountants	Permanently engaged		
					servants	day hands	
	1	2	3	4	5	6	7
a) Absolute figures:							
Under 5 acres.	490 762	540 046	1 265 844	1 818	38 802	20 514	236 634
Between 5 and 12 ½ acres . . .	379 077	543 480	343 162	1 423	47 864	18 244	164 549
» 12 ½ and 50 » . . .	541 840	937 164	336 851	3 785	274 873	52 162	371 663
» 50 and 250 » . . .	172 940	278 799	83 272	8 474	405 293	135 537	290 332
Over 250 » . . .	19 363	7 639	3 342	40 627	181 103	459 003	324 193
Totals . . .	1 603 982	2 307 128	2 032 471	56 177	947 935	685 460	2 387 371

b) *Out of every* 100 *persons engaged in agriculture the distribution according to size of farm was:*

				2 and 3					4, 5, 6 and 7
Under 5 acres	18.9	20.8	48.8	69.6	0.1	1.5	0.8	9.1	11.5
Between 5 and 12 ½ acres . . .	25.3	36.3	22.9	59.2	0.1	3.2	1.2	11.0	15.5
» 12 ½ and 50 » . . .	21.5	37.2	13.4	50.6	0.1	10.9	2.1	14.8	27.9
» 50 and 250 » . . .	12.6	20.3	6.0	26.3	0.6	29.5	9.9	21.1	61.1
Over 250 » . . .	1.9	0.7	0.3	1.0	4.0	17.5	44.3	31.3	97.1
On all the farms . . .	17.8	25.6	22.5	48.1	0.6	10.5	7.6	15.4	34.1

In this table are included the persons engaged in forest work on the agricultural areas, but the results are but insignificantly affected by this inclusion.

The preponderance of women in the two classes of smallest area is due to the fact that in the small farms the work is for the most part done by the holders themselves with the members of their families, especially the women folk (wives, and daughters).

As for the *intensity of the work*, an idea can be gained when the number of persons engaged per area of 100 acres is considered. It appears that the number of persons engaged diminishes with the increase of the area of the holding. In these figures, however, the real numbers of workers do not appear with exactitude, because in the smaller and middle sized farms there are persons returned as present whose work is only partially or not at all devoted to farming. The real numbers of workers in the classes of the smaller holdings are in reality smaller than those returned.

According to the position held in the farms, the statistics distinguish between: *managers, members of the family* and *labourers.*

The numbers of persons in Prussia on June 11, 1907, belonging to these three groups are shown in Table II.

From the above figures it appears that in the whole State the persons employed in agriculture are to the extent of about two-thirds members of the holders' family and one-third hired labourers. The ratio between the members of the holders' family and the strangers varies of course considerably according to the size of the farm. In the smaller-sized holdings the holders and the members of their families prevail, namely for the smallest holdings they are 88.5 per cent., for small farms 84.5 per cent., for medium-sized farms 72.1 per cent. and for large estates a very low percentage. The reverse is the case with hired labour. In the smallest farms it is employed very sparingly, in medium-sized farms it is 27.9 per cent. of the total, and in large estates it attains to 97.1 per cent.

Table II shows the character of the agricultural working population. The members of the holders' families are divided into two main groups: those who are permanently employed on the farms and those only temporarily engaged; more than half of the members of families belong to the first group. Their number increases generally with the size of the farm, whilst the temporarily engaged members are found in the greatest numbers in the smallest holdings. In these, during ordinary periods but a small amount of labour is required, and during the short periods in which there is much work to be done the members of the holders' families assist. Hired labour is divided into overseers and accountants, permanently (farm servants and maids, and day labourers) and temporarily engaged hands. To the latter belong especially non-resident hands.

The first group is an exceedingly small one. The greatest part is formed by the permanent labourers, among whom there are more farm servants and maids than day labourers. In each of the classes according to size of farm the distribution of these labourers varies greatly. The proportion of farm servants and maids increases with the size of the farm, but diminishes again in the largest farms, in which the greatest contingent is that of day labourers.

This distribution of agricultural labour is of the greatest importance for the study of the labour question. The large estates are especially affected by the want of permanent hands. A sufficient number of farm servants and maids is a vital necessity for large estates, for without them the regular work of the farm cannot be carried on. This is seen also from the distribution of permanent and temporary hired labourers. The latter are relatively more numerous in the smaller holdings and diminish with the increase in the size of the farm.

The small holdings are in a position to attract outside labourers during the busiest periods of the year, when the assistance of the members of the family is insufficient or not available. For the larger farms a staff of permanent labourers is absolutely necessary, because they cannot, like the smaller ones, avail themselves during the busy time of the temporarily disengaged hands.

The work of children, that is persons under the age of fourteen, is, as may be seen from Table III, an important factor.

TABLE III.

		Numbers of children employed	Numbers of children among 100 persons employed in the corresponding class
Members of the farmer's family	permanently	35 531	1.54
	temporarily	225 7[illegible]3	11.10
Outside labour	permanently	32 150	2.32
	temporarily	54 714	3.24

Lastly the following average figures for the kingdom of Prussia are given as to the sizes of the farms.

	Percentage of area
Farms under 12.5 acres	12.9
» between 12.5 and 50 acres	27.7
» » 50 » 250 »	31.3
» over 250 » »	28 1

The following figures show the percentage of productive land occupied by various crops:

	per cent.
Cereals	48.4
Forage crops.	25.8
Potatoes and beets.	12.6

The average number of persons engaged on 100 acres of productive land in Prussia is 17.4.

1193 - **The Farmer's Income in the United States.** — SPILLMAN, W. J in *United States Department of Agriculture, Bureau of Plant Industry, Circular* No. 132, pp. 3-7. Washington, July 19, 1913.

The data upon which this article is based are obtained from the census of 1910, combined with certain factors worked out in the experience of the Office of Farm Management in conducting farm management surveys.

There are two items of income about which no information is available, *viz.* the value of the milk and cream consumed on the farm, and what the farmer earns for work outside his farm; and one item of expenditure which cannot be determined, *viz.* the amount paid for live stock. The data presented in the accompanying table should be interpreted in the light of these omissions.

The average area of the American farm in 1910 was 138.1 acres, 75.2 acres of which are classed as improved land and 49.77 acres as devoted to crops. The total average investment per farm is $6 443.67, the amount in farm buildings being $ 994.33 and that in implements and machinery $ 198.88.

All the data for the receipts as given in the table were obtained from census returns. The farm is also credited with the total value of all the crops produced except that part fed to live stock, which is obtained by deducting the value of forage sold from the total value of the forage crops. The farm is thus credited with the butter, cheese, eggs, poultry, honey, meat, fruits, vegetables, bread, etc., consumed on the farm where it is produced, and the value thus consumed on the farm is included in the farm income.

Any revenue from outside sources should be added to the net income given in Table I.

The expenses for labour, fertilisers and fodder are obtained from the census returns also. The cost of maintenance of farm buildings is placed at 5 per cent. of their value, and that of implements and machinery (including repairs) at 20 per cent. of their cash value, both figures being based on extensive investigations by the Office of Farm Management, and agreeing with the estimates in Warren's " Farm Management ". Taxes are assumed to be 0.6 per cent. as an average for the whole country.

The remaining items of expense in the conduct of a farm are collectively calculated as 15 per cent. of other expenditure, which is the average obtained from a number of farm management surveys conducted by the Office of Farm Management. The total farm expenses, omitting the item of live stock purchased, amount to $340.15.

The farm income is obtained by deducting the total expenses from the total receipts, and amounts to $640.40. Assuming 5 per cent. as the rate of interest to which the farm investment (of $ 6 443.67) is entitled, the farm income is then distributed between interest and labour income as follows: Interest on investment, $ 322.18; labour income $ 318.22.

The average farm mortgage based on the number of all farms, is $1 715, which at 6 per cent. per annum amounts to $102.90. Deducting this amount from the farm income of $ 640.40 we get $537.50 (to which must be

TABLE. — *Labour income of farmers in the United States.*

Item			Total	Amount per farm
Number of farms			6 361 502	—
Improved land acres.			478 451 750	75.2
Total farm investment			$ 40 991 449 090	$ 6 443.67
Investment in farm buildings			$ 6 325 451 528	$ 994.33
Investment in implemants and machinery			$ 1 265 149 783	$ 198.88
Receipts.				
Dairy products (excluding milk and cream used at home)			596 413 463	$ 93.75
Wool			65 472 328	10.29
Mohair			901 597	0.14
Eggs produced			306 688 960	48.21
Poultry raised			202 506 272	31.83
Honey and wax			5 992 083	0.94
Domestic animals sold			1 562 936 694	245.69
Domestic animals slaughtered			270 238 793	42.48
Total value of all crops		$ 5 487 161 223		
Corn	1 438 583 919			
Oats	414 697 422			
Barley	92 458 571			
Hay, etc.	824 004 877			
Total value of crops used for feeding	2 769 714 789			
Feed sold	509 253 522			
Net value of crops fed		2 260 461 267		
Net value of crops			3 226 699 956	507.22
Total gross farm income			6 237 850 146	980.55
Expenses.				
Labour			$ 651 611 287	$ 102.43
Fertilisers			114 882 541	18.06
Feed			299 839 857	47.13
Maintenance of buildings (at 5 %)			316 272 576	49.72
Maintenance of implements and machinery (20 %)			253 029 956	39.78
Taxes (0.6 %)			245 947 694	38.66
Total			1 881 584 911	295.78
Miscellaneous expenses (15 % of other expenses)			282 237 736	44.37
Total expenses			2 163 822 647	340.15
Summary.				
Total gross income			$ 6 237 850 146	$ 980.55
Total expenses			2 163 822 647	340.15
Net farm income			4 074 027 499	640.40
Interest on investment (at 5 %)			2 049 572 454	322.18
Labour income			2 024 455 045	318.22
Interest on mortgage ($ 1 715 at 6 %)				102.90
Available for purchase of live stock and for family living				537.50

added the value of milk and cream consumed on the farm and any outside income) as the sum to be used in the purchase of live stock, in living expenses, and in savings.

As the majority of farmers are capitalists, the interest on capital constitutes part of the income and the labour income is undoubtedly smaller than it would be if the farmer did not also have the interest on his capital. Thus, we find that in the better agricultural sections, the labour income of tenants is considerably higher than that of farmers who work their own farms, though the latter may have larger total incomes than the tenants. In fact a large number of American farmers live on the interest of their investment and do not receive anything for their own wages. But this is not possible on the small farm, where the interest is too small to admit a high standard of living, and the farmer must have some labour income in addition.

In America it is reasonable to infer that at least half the farm families of the country have incomes smaller than those given in Table I. Individual farmers here and there have larger incomes than this average, but the facts presented in the table indicate that on the whole the income of farmers in this country, even when we include as a part of the income those things consumed on the farm where they are produced, is certainly not more than sufficient to pay 5 per cent. on the investment and ordinary farm wages for the labour they do, and it is probably considerably less than this.

1194 - **Notes on Tobacco-Growing in Germany.** — LANG, H. Einiges aus dem Gebiet der deutschen Tabakstatistik. — *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 12, pp. 409-426. Stuttgart, June 13, 1913.

The number of German tobacco-growers has much decreased during the last 20 years, for while in the five years 1891-1895 there were 151 390 persons growing this crop in the district under the jurisdiction of the German Customs, the figures for the subsequent periods of five years were as follows :

1896-1900	136 352
1901-1905	108 606
1906-1910	95 369

The tobacco growers have thus progressively decreased in the proportion 100 : 90.1 : 71.7 : 62.9. The following table gives the details of this decrease in the principal tobacco-producing districts of Germany :

Years	Prussia			Baden			Bavaria	Alsace-Lorraine	Wurtemburg
	Number of planters	in % of the total number of the Empire	in % of the numbers of the first 5 years' period	Number of planters	in % of the total number of the Empire	in % of the numbers of the first five years	Number of planters in % of the numbers of the first five years' period		
1891-1895. . . .	82 962	54.8	100	37 469	24.8	100	100	100	100
1896-1900. . . .	68 444	50.2	82.5	39 125	28.7	104.4	91.4	89.2	112.2
1901-1905 . . .	49 445	45.5	59.6	34 694	31.9	92.6	83.0	71.7	89.0
1906-1910. . . .	37 582	39.5	45.3	34 316	36.0	91.6	79.9	64.9	103.2

The area cultivated by each tobacco-grower has, however, considerably increased, and consequently the total area under tobacco has decreased in a proportion very different from that in which the number of cultivators has diminished. The cultivated area was as follows:

1891-1895	43 021	acres
1896-1900	44 748	»
1901-1905	39 908	»
1906-1910	37 647	»

The decrease occurred in the following proportion 100 : 104.0 : 92.7: 87.5. The increase or decrease of the area under tobacco in the various districts is shown by the following table.

TABLE II.

Years	In % of the total under tobacco in the Empire		In % of the area under tobacco in the different districts during the first five years.					
	Prussia	Baden	Prussia	Baden	Bavaria	Alsace-Lorraine	Wurt-emburg	Hesse
1891–1895	29.2	39.9	100	100	100	100	100	100
1896–1900	29.8	41.2	106.3	107.5	94.8	102.0	105.5	95.7
1901–1905	29.1	41.0	92.6	95.4	88.8	96.4	80.5	83.4
1906–1910	25.8	43.3	77.3	95.0	85.5	101.7	85.8	83.8

In consequence of the decrease in the area under tobacco, and owing to the fact that the yield per acre has rather diminished than increased, the total production of tobacco, after a temporary rise in the second five-year period, fell considerably in the two succeeding five-year periods, as is shown by the following figures:

	Amount of tobacco gathered (dry)	
	Absolute amount —	Relative amount in % of the first five-year period
1891-1895	722 767	100
1896-1900	742 320	102.9
1901-1905	695 382	96.2
1906-1910	599 049	82.9

The proportions for the various States are given in Table III.

TABLE III.

	Prussia	**Baden**	**Bavaria**	**Alsace-Lorraine**
1891-1895	100	100	100	100
1896-1900	96.8	109.0	98.1	104.0
1901-1905	90 2	100.8	95.5	100.7
1906-1910	74.0	86.7	83.8	97.2

While the production decreases, the price of tobacco rises, and as this latter movement is relatively stronger than the former, the result is an increase in the total value of the crops.

TABLE IV.

	Total value of annual tobacco crop in Germany £	**General movement**	**Increase and decrease in the various States**					
			Prussia	**Baden**	**Bavaria**	**Alsace-Lorraine**	**Wurtemburg**	**Hesse**
1891-1895 . . .	1 434 097	100	100	100	100	100	100	100
1896-1900 . . .	1 484 798	103.5	94.4	112.2	101.8	103.0	99.5	87.4
1901-1905 . . .	1 436 863	100.1	90.7	105.0	103.2	109.7	90.1	87.8
1906-1910 . . .	1 536 658	107.1	92.2	112.8	114.2	129.3	109.3	86.0

The average crop per surface unit has, on the whole, remained about the same ; it was as follows per acre throughout the Empire :

1901-1905.	16.81 cwt.
1906-1900.	16.61 »
1901-1905.	17.44 »
1906-1910.	15.93 «

Great variations have been found in the yield per acre in different districts. If the average crop in each period of five years is taken at 100, the yield per acre is as given in Table V.

TABLE V.

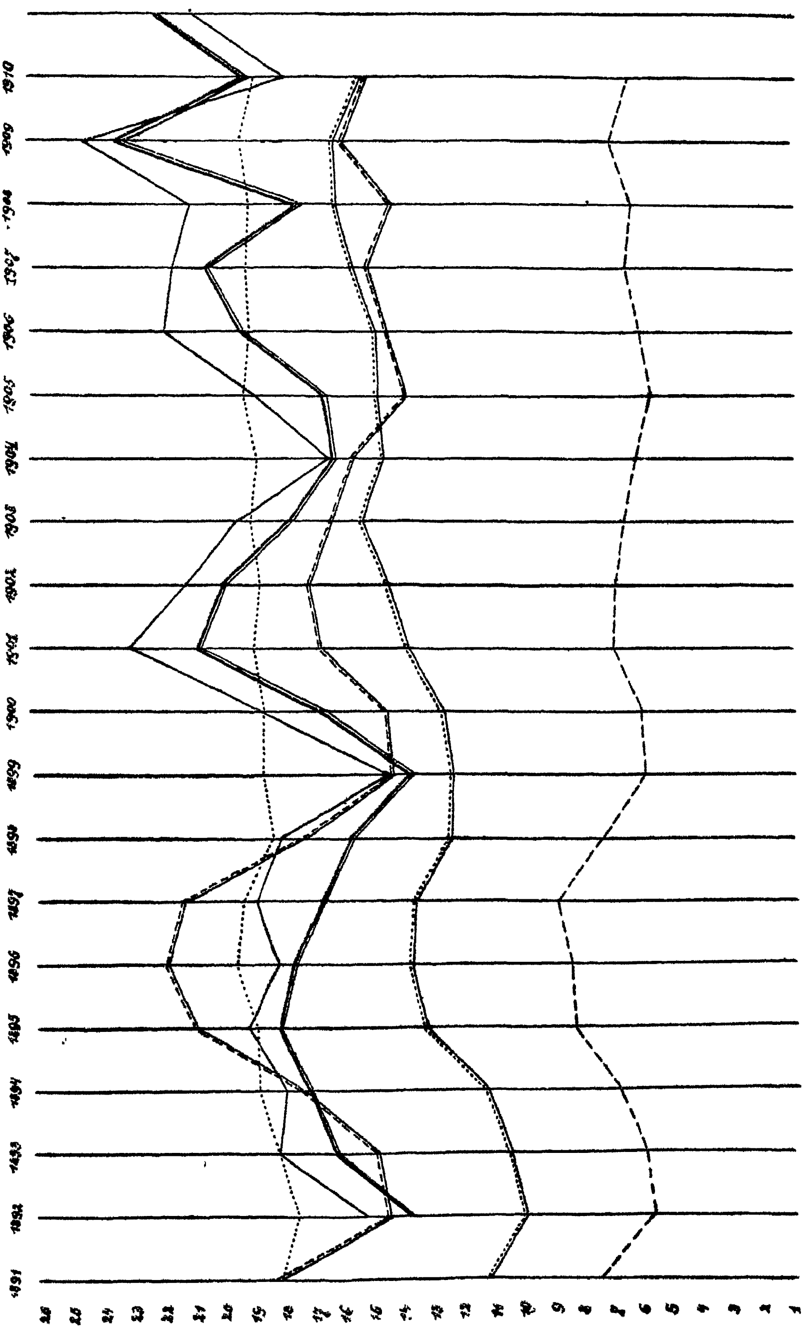
	Prussia	Baden	Bavaria	Wurtemburg	Alsace-Lorraine	Hesse
1891-1895 . . .	96.9	102.3	as a rule from 6 to 10 % below the average for the Empire	102.3	124.4	80.2
1896-1900 . .	90.3	105.6		104.9	128.7	79.5
1901-1905 . . .	91.1	104.6		107.1	126.8	84.4
1906-1910 . . .	98.6	99.5		109.4	127.2	77.0

The average price of tobacco has risen thoughout the Empire during the four five-year periods to 39*s* 8*d*, 40*s*, 41*s* 3*d*, and 51*s* 3*d* respectively. It has thus increased proportionately from 100 to 100.9, 104.1 and 129.1. The money return per acre has also notably increased. It rose from £33 7*s* in the first five-year period, and £33 3*s* 9*d* in the second, to £36 0*s* 6*d* and £40 16*s* 6*d* in the two last periods. The proportion is thus 100 : 99.5 : 107.9 : 122.3. Nevertheless, the different States have taken very unequal parts in this development, as is shown by Table VI.

TABLE VI. — *Value of the crop per surface unit in % of the value of the first five-year period.*

	Prussia	Baden	Bavaria	Wurtemburg	Alsace-Lorraine	Hesse
1891-1895	100	100	100	100	100	100
1896-1900	88.7	104.2	107.3	94.3	101.0	100.3
1901-1905	97.8	110.0	116.5	111.9	113.6	123.0
1906-1910	119.1	118.7	133.7	127.1	127.0	133.1

The value of the tobacco produced per surface unit varies much from one year to another; these fluctuations not only cause uncertainty and anxiety to the growers, but have a considerable influence upon the general initiative of the planters. After some good seasons, the area under tobacco at once increases, not only because new cultivators add fresh plantations to those already existing, but also from an extension of the former tobacco-fields. On the other hand, after some bad seasons, not only do many planters abandon the undertaking, but those who remain faithful to the industry reduce the area under cultivation. The writer gives a graphic representa-



Fluctuations of the returns from 1 hectare of tobacco in the German Empire and in the Grand Duchy of Baden from 1891 to 1910.
(For explanation, see text, p. 1627).

tion of this movement in the German Empire and the Grand Duchy of Baden. (The double lines refer to the former, and the single lines to the latter). The graphic curve gives the amount realized each year by the tobacco yield of one hectare (2.47 acres): the figures at the extreme left each represent 100 marks (about £5). The two curves referring to the Empire and the Grand Duchy of Baden (continuous lines) are displaced by a column — that is to say by a year — towards the right. This is done in order to show more clearly that the crop obtained one year has an undoubted effect upon the area placed under tobacco the next year, and that this occurs with the utmost regularity. As for the area under tobacco in any given year (broken lines), the figures on the extreme left each represent 1000 ha. (2470 acres), while in the case of the figures relating to the area cultivated by each planter (dotted lines), every figure represents one are (4 rods).

AGRICULTURAL INDUSTRIES.

1195 - **A Practical Formula for the Calculation of the Solids not Fat in Milk.** — HÖYBERG, M. H. in *Zeitschrift für Fleisch- und Milch-hygiene*, Year 23, Part 23, pp. 539-541. Berlin, September 1, 1913. DAIRYING

The formula given by the writer is based upon the same principle as that of Bertschinger, viz:

$$\text{Solids not fat} = \frac{\text{degree of lactodensimeter} + \text{percentage of fat}}{4}$$

If, for instance, the specific gravity of the milk is 1.034 and the fat content 2.8 per cent, the solids not fat $= \frac{34.0 + 2.8}{4} = 9.2$.

This formula has the advantages of being simple and accurate, and of giving quick results.

Also, as is seen by the experimental data reproduced in Tables I, II, and III (1), it is superior to Ackermann's automatic calculator, and especially adapted for testing doubtful milk.

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(1) The Tables 1 and 2 are reproduced in a slightly abridged form. (*Ed.*).

TABLE I. — *Results obtained from samples of doubtful milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat		
			according to chemical analysis	according to the new formula	according to Ackermann's automatic calculator
1	1.0270	2.38	7.34	7.34	7.47
3	1.0300	2.70	8.07	8.17	8.30
4	1.0257	3.00	7.11	7.17	7.27
6	1.0312	2.24	8.43	8.36	8.49
8	1.0326	2.02	8.68	8.65	8.85
9	1.0293	3.08	8.05	8.09	8.20
11	1.0257	2.71	7.25	7.10	7.21
12	1.0275	2.79	7.41	7.57	7.68
14	1.0295	2.21	8.02	7.92	8.06
16	1.0268	2.66	7.17	7.36	7.48
17	1.0308	2.26	8.41	8.26	8.39
19	1.0287	2.38	7.34	7.77	7.90
20	1.0292	2.64	7.79	7.96	8.08
22	1.0296	2.40	7.83	8.00	8.13
24	1.0292	2.16	7.63	7.84	7.98

TABLE II. — *Results obtained from samples of normal milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat		
			according to chemical analysis	according to the new formula	according to Ackermann's automatic calculator
1	1.0330	3.44	9.12	9.11	9.19
3	1.0320	4.14	9.06	9.03	9.07
4	1.0315	4.19	8.96	8.92	8.96
6	1.0330	3.04	9.06	9.01	9.12
7	1.0320	3.23	8.77	8.80	8.91
9	1.0310	3.27	8.47	8.56	8.78
11	1.0315	3.21	8.83	8.67	8.77
12	1.0325	3.38	9.10	8.97	8.76
14	1.0315	3.21	8.83	8.67	8.77
15	1.0320	2.97	8.98	8.74	8.85
16	1.0320	3.14	9.02	8.78	8.90
17	1.0320	3.00	9.02	8.75	8.85
18	1.0320	3.22	8.51	8.80	8.91
20	1.0320	3.51	8.59	8.87	8.05

TABLE III. — *Results obtained with samples of half milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat	
			according to chemical analysis	according to the new formula
1	1.0288	0.89	7.45	7.41
2	1.0342	0.91	8.72	8.77
3	1.0340	0.97	8.35	8.74
4	1.0262	0.88	6.66	6.67
5	1.0292	0.94	7.58	7.53
6	1.0349	0.90	8.91	8.95
7	1.0362	1.05	9.11	9.31

1196 - **The Specific Gravity of Cow's Milk and the Change it Undergoes Shortly After Milking.** — FLEISCHMANN and WIEGNER in *Journal für Landwirtschaft*, Vol. 61, Part 3, pp. 283-323. Berlin, July 21, 1913.

Quévenne, the inventor of the lactodensimeter, had already observed that in the course of the first 4 to 6 hours subsequent to milking, the specific gravity of cow's milk increased on the average 0.0008 to 0.0015, when it was kept at a temperature below 30°C. Opinions have hitherto been much divided as to the causes of this property possessed by milk. Quévenne, and later Reiss and Sommerfeld, thought that this increase in specific gravity occurred through the volatilization, immediately after milking, of the gases present in solution in the milk. Bouchardat considered the increase in specific gravity to be due to a molecular change in the structure of the sugar of milk. Other investigators attributed the phenomenon to a specific movement of the fat globules. Recknagel, Kirchner and Fleischmann considered that the casein globules expanded further. Lately, the alteration in the volume of the fat globules has often been cited as the cause of the change in the specific gravity of milk. So far, however, the literature dealing with the subject has furnished no reliable data based on accurate investigations.

The writers have subjected to rigorous examination all the accounts of the experiments hitherto made to elucidate this cicumstance, and to the same end have themselves carried out exhaustive investigations in the Laboratory of Milk Chemistry at the Göttingen University. The results prove that the hypothesis of gas volatilization does not explain the phenomenon. No alteration in the milk sugar or movement of the globules, such as could increase the specific gravity, was observed. No support was found for the theory of the expansion of the casein globules which was put forward by Recknagel. The writers, however, observed the existence of a certain inter relation between increased specific gravity and the presence of fat globules. When, for instance, the milk was kept for 22 hours at the same temperature as at the moment of milking, no increase in specific gravity was noticed. The specific gravity of milk which had been recently milked and then cooled down to 3°C., increased 0.0015; on the milk being subsequently warmed up to 45°C., the specific gravity sank to what it was before. Skimmed milk did not increase in specific gravity even after a longer time, or after having been cooled to a lower temperature. The larger the fat content, the higher the increase in specific gravity if the milk was kept below the melting point of the butter fat. Kept at body heat, milk with a high or with a low fat content underwent no change in its specific gravity. Solidified butter fat possesses a higher specific gravity than liquid butter fat. The specific gravity of emulsions of fat and water is less than that of fat.

The temperature oscillations of the milk globules were produced with the same rapidity as those of the milk plasma. The writers have come to the conclusion, as a result of their researches, that the increase in specific gravity which occurs in the case of milk which has recently been milked, is due to the coagulation of the fat globules present.

1197 - **Practical Methods for the Determination of Fat in Cheeses. Comparison of the Methods in Use, with Special Regard to the New Processes of Kooper and Wendler.** — HERRAMHOF, H. in *Molkerei-Zeitung*, Year 27, No. 54, pp. 1053-1054. Hildesheim, July 16, 1913.

The writer speaks of the methods most usually employed for the determination of the fat in cheese, *viz.* those of Siegfeld and Gerber; he compares them with Kooper and Wendler's methods and gives the results of comparative experiments, comparing the data thus obtained with the results of the Bondzinski-Radzlaff method. He thus shows, that for the analysis of cheese rich in fatty matter, the Siegfeld method and those of Kooper and Wendler are as suitable, and give almost as accurate results, as the Bondzinski-Radzlaff process. The Kooper method is the one most adapted for the estimation of fatty matter in cheeses which are poor in fat.

MEAT
NDUSTRY

1198 - **The Consumption of Meat and Milk in Japan in 1911.** — *The Annual Repor of the Central Sanitary Bureau of the Imperial Japanese Government for the* 44th *Year o Meiji* (1911), pp. III + 73 + 172 + 106. Tokyo, 1913.

The number of slaughter-houses existing at the end of 1911 was 495, of which 219 were public, and 276 private. The number of animals slaughtered is given in Table I:

The average annual consumption of meat per inhabitant in 1911 was 2.74 lbs.

The number of animals prohibited to be slaughtered after examination was 460 bullocks, 46 calves, 54 pigs and 316 horses. The number of animals ordered to be entirely thrown away after slaughtering was 193 bullocks, 6 calves, 47 pigs and 17 horses, while that of those of which only parts were thrown away was 5165 bullocks, 92 calves, 2296 pigs and 1181 horses. Besides these there were some cases where the viscera only were ordered to be thrown away.

TABLE I.

	No. of animals slaughtered	Weight of meat — lbs.	Average weigth of meat per animal — lbs.
Bullocks	262 588	97 640 000	371.84
Calves	21 858	2 395 600	109.60
Sheep and goats	2 488	24 350	25.73
Pigs	198 423	23 415 500	118.01
Horses	66 555	16 527 500	248.33

At the end of 1911, there weie in Japan 5691 dairy-farms; these had produced during the year 10 113 000 gallons of milk, which corresponds to an annual consumption per head of 1 ½ pint. Compared with the previous year, there was an increase of 2.6 per cent. in the number of dairies, and of 9.8 per cent. in the production of cow's milk. The prefectures of Kyoto, Tottori, and Kagoshima produced 7 460 gallons of goat's milk, that is four times as much as in the preceding year. There were 47 condensed milk factories, which turned out 1 480 000 lbs.

Table II gives the amount of milk and of condensed milk produced in the chief dairy prefectures.

Prefecture	Milk — galls	Condensed milk — lb.
Tokyo	1 748 000	70 250
Osaka	655 000	17 930
Hyogo	432 700	2,740
Gumma	241 900	156 250
Chiba	110 900	273 850
Aichi	491 100	—
Shizuoka	331 800	663 800
Yamaguchi	163 550	122 500
Hokkaido	461 400	131 500

WOOL INDUSTRY

1199 - **Annual Wool Review for Australasia.** — *Dalgety's Review (Australasia). Annual Wool Number* 1913, p. 83. Sydney, July 1, 1913.

The total quantity of wool of Australasia exported has been 2 247 265 bales or 721 821 516lbs., as against 2 537 867 bales or 840 694 748lbs. in 1911-12. To arrive at the actual production it is necessary to add the amount of wool used by manufacturers in Australasia, namely, 87 775 bales or 28 175 775 lbs. The result shows the actual production of wool for the past twelve months to have been 2 335 040 bales or 749 997 291 lbs., as against 2 637 127 bales or 873 549 808 lbs. in 1911-12.

The average weight per bale of the past clip as dealt with in Australasian markets is 321.2 lbs., as against 331.2 lbs. for the previous year, 332.1 lbs. for 1910-11, 335.5 lbs. in 1909-10, 330.6 lbs. in 1908-9, 333.7 lbs. in 1907-8, and 339.7 lbs. in 1906-7.

It will be seen that the decreased average weight of the bales during the past wool year has been 10 lbs., whilst compared with six years ago the decrease in weight is no less than 19.7 lbs.

Sheep numbers as at the close of the year show the very serious falling off of 9 809 634 head, as compared with the same point twelve months ago, and it will take a succession of good seasons to regain the lost ground. Details as to the number for each State compared with those returned at the end of the two preceding years are shown in Table I.

TABLE I.

States	1912	1911	1910
New South Wales	39 436 118	45 032 022	45 825 308
Victoria	11 892 224	13 857 804	12 937 983
Queensland	20 248 580	20 387 838	20 153 239
South Australia	5 481 487	6 267 477	6 432 038
West Australia	4 593 458	5 408 583	5 157 658
Tasmania	1 800 000	1 788 310	1 735 000
Commonwealth	83 451 867	92 742 034	92 241 226
New Zéaland	23 750 153	24 269 620	23 792 947
Australasia	107 202 020	117 011 654	116 034 173

The average price per bale realised for the 1 804 801 bales sold in Australasian markets has been £13 13*s* 1*d*, which compares with £11 15*s* 5*d* in 1911-12, £ 12 10*s* 4*d* in 1910-11, £13 12*s* 2*d* in 1909-10, and £ 12 9*s* 0*d* for the past thirteen years.

The value of the clip sold in Australasia during the past year has amounted to £ 24 642 643, whereas during the previous year 1 926 926 bales realised £22 682 090, and in 1910-11 the 1 865 167 bales sold realised £23 346 602. The average number of bales sold in the Australasian markets during the past seven years has been 1 719 066, and the average realisation £22 086 002 per annum.

The past clip was composed of 69 per cent. merino, and 31 per cent. crossbred, a slight increase in the proportion of crossbred as compared with the previous year, when the respective proportions were 72 and 28 per cent. The clip of 1910-11 was composed of 76 per cent. merino, and 24 per cent. crossbred, while in 1908-9 there was 78 per cent. of merino and 22 per cent. of crossbred.

The comparative failure of the 1912 lambing is revealed by the quantity of lambs' wool sold in Australasia during the past twelve months, which amounted to 65 106 bales, as compared with 93 050 bales for the preceding season, 98 314 bales for 1910-11, 108 808 bales in 1909-10, 69 456 bales in 1908-9, and 70 980 bales in 1907-8. The proportion of lambs' to fleece was 4 per cent., as compared with 5 per cent. for the two preceding years, and 6 per cent., 4 per cent., 5 per cent., and 7 per cent. respectively for the four years before that date.

The quantity of scoured wool sold in Australasian markets has been 149 611 bales, or 8 per cent. of the total wool sold, which compares with 144 046 bales, or 7 per cent., in 1911-12; 160 326 bales, or 9 per cent., in 1910-11; 195 241 bales, or 10 per cent., in 1909-10; and 177 877 bales, or 11 per cent., in 1908-9.

VARIOUS

1200 - **Experimental Contributions on the Subject of the Disinfection of Hides and Fleeces containing Anthrax Spores.** — SÉVCIK in *Zeitschrift für Infektionskrankheiten, Parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 13, Part 6, pp. 322-348; Part 7, pp. 429-452. Berlin, June and July 1913.

An account of culture experiments and experiments on animals undertaken for the purpose of testing the methods adopted by Seymour-Jones and Schattenfroh for the disinfection of hides and fleeces containing anthrax spores.

It was shown that a 0.02 per cent. solution of sublimate, as recommended by Seymour-Jones for dried sheep-skins and large hides, is unreliable, and that ox-hides, even if placed in a solution of sublimate ten times as strong and left there for 48 hours, are not necessarily free from infection.

Schattenfroh's method was perfectly satisfactory for the sterilization of guinea-pig and rabbit skins, but was not efficacious in the case of ox-hides and grease-free sheep-skins. On account of its cheapness and the small amount of danger it entails, this system is to be recommended for the sterilization of small skins.

WINE-MAKING

1201 - **Notes on the Vine-Growing Districts of Chile** (1). CANU, G. (Director of the Oenological Station of Chile) in *Annales de la Science Agronomique*, Year 30, No. 5, pp. 351-365. Paris, May 1913.

Vine-growing is one of the most ancient and most important industries of Chile.

Conditions of vine-cultivation. — A large portion of Chile lies between the 30th and 38th degrees of south latitude which delimit the area which is essentially suitable to vine cultivation. This area is bounded on the east by the Andes, while on the west, the temperature is regulated by the presence of the Pacific Ocean. This vast zone enjoys an exceptional climate and is free from hail storms. The rainy season coincides with the winter, the long summer is hot and dry, spring frosts are rare, and cryptogamic diseases infrequent. *Oidium* exists, but though sulphur dustings are often carelessly carried out, this fungus does little harm. Mildew is practically non-existent. On the other hand, anthracnose has made its appearance in several departments. Further, *Conchylis ambiguella, Haltica ampelophaga, Eudemis* (*Polychrosis*) *botrana* and *Oenophtira pilleriana* are unknown in Chile, though other parasites exist there, such as *Phytoptus vitis, Tetranychus* sp., *Tylenchus* sp. and even *Margarodes viticum.* To all the other advantages Chile possesses should be added a plentiful supply of water, at least in the valleys where most of the vineyards are situated. The streams descending in large numbers from the Andes permit of the systematic irrigation of the vines according to the requirements of the different vineyards.

Methods of vine-growing and wine-making. — These vary according to the several zones. If the old vines of the country, owing to their thick planting, do not receive all the attention they require, the new French vines, which are planted in lines and supported by iron wire, are, as a rule, carefully tended as regards the cleanliness of the soil, and are systematically pruned. Further, while the cellars belonging to the old Spanish vineyards are nearly all badly constructed and provided with very primitive plant, those properties are numerous where the cellars are carefully made and are furnished with all the appliances which are requisite for handling the crop and for subsequent work in the cellar.

The Wine-making Station of Chile has greatly contributed to the improvement of the methods of work, by its critical studies of the native wines, its repeated advice, and by the publication of numerous installation plans. Further, by means of lectures held on the spot in the different vine-growing regions, and an incessant propaganda, it encourages and promotes industrial methods of wine-making.

Chilian wines — From certain French vines, *viz.* Cabernet, Merlot, Cot, Verdot, there are produced in the neighbourhood of Santiago, especially in the "Llano de Maipo" and the "Llano Subercaseux", full-bodied red wines, of relatively good quality and bouquet, which resemble Bordeaux and work up fairly quickly, but improve little on keeping. From Pinot-noir when gathered before it is over-ripe, and treated with care, relatively light wines are produced; these are good in quality and have a delicate flavour, somewhat resembling Burgundies.

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(1) See No. 1638, *B.* Dec. 1912. (*Ed.*).

Speaking generally, in the same zone, the white wines are inferior to the red; Sémillon, in particular, is nearly always deficient in mellowness. On the other hand, some cellars produce from Pinot-blanc a very mellow wine with a pleasant bouquet. Some experiments should be mentioned which were made with wines resembling certain types of Sauternais. By these it was proved that with a little method and perseverance it is possible to obtain wines possessing bouquet and preserving a certain amount of aroma. The following table gives the analyses of wines made from different vines, for the purpose of determining a few of the chemical characteristics of these products. The wines analysed were new, as a rule.

TABLE I. — *Wines from the neighbourhood of Santiago.*

Composition	Cabernet	Pinot	Merlot	Verdot	Romano	Sémillon	Sauvignon	Pinot blanc	Folle blanche
Density	995.2	995.4	994.7	994.8	995.6	992.0	992.0	991.4	995.8
Alcohol per cent. in vol.	11.8	12.5	12.2	11.0	12.4	12.1	10.9	12.0	10.4
Extract at 100°, per 1000	24.34	26.12	22.18	17.44	26.66	16.68	12.2	13.04	21.00
Reducing substances in glucose per 1000 . .	2.17	2.47	2.17	1.92	2.97	1.92	0.78	1.43	1.78
Sulphates in Potassium sulphates, per 1000 .	0.55	0.54	0.39	0.33	0.37	0.40	0.32	0.37	0.59
Cream of tartar per 1000	3.06	2.46	3.13	3.57	3.81	2.53	3.13	1.78	3.96
Mineral matters p. 1000	2.42	2.56	2.82	1.96	1.44	1.50	1.36	1.48	2.04
Total acidity in H_2SO_4 per 1000.	2.94	4.13	3.80	4.04	4.86	4.74	4.09	3.76	5.45
Volatile acidity, in $C_2H_4O_2$ per 1000. .	0.31	0.49	0.30	0.39	0.40	0.34	0.74	0.82	0.67

Another important vine-growing zone is that of "Lontué" and "Talca." The crops are often larger than those in the neighbouthood of Santiago, especially in the first of the above localities. The wines are less alcoholic and poorer in dry extract; they are also inferior in quality. Table II contains some types of analyses of the wines of this district.

TABLE II. — *Lontué Wines.*

	Cabernet	Pinot	Cot	Merlot	Sémillon	Pinot blanc
Density	944.5	993.4	994.3	995.4	993.0	994.3
Alcohol per cent. in vol. . . .	11.8	11.9	11.2	11.2	12.7	11.7
Extract at 100°, per 1000 . . .	21.12	16.78	20.34	22.90	19.40	20.34
Reducing substances, in glucose per 1000	1.66	1.85	1.47	0.78	2.25	2.27
Sulphates, in potassium sulphate per 1000	0.35	0.34	0.30	0.49	0.33	0.32
Cream of tartar per 1000 . . .	3.65	2.61	3.21	3.43	2.53	3.57
Mineral substances per 1000 . .	2.30	2.04	2.42	2.70	1.24	—
Total acidity, in H_2SO_4 per 1000.	3.92	3.19	3.35	4.53	4.11	3.56
Volatile acidity, in $C_2H_4O_2$ per 1000	0.41	0.32	0.35	0.79	0.30	0.32

TABLE III. — *Wines of the Coast Cordilleras.*

	Red wines of the country — Provinces of			Sémillon	White wines of the country — Provinces of		
	Linares	Maules	Concepcion		Linares	Maules	Concepcion
Density	995.2	997.5	996.1	991.2	993.0	996.4	993.8
Alcohol per cent. in vol. . . .	10.9	12.2	9.2	11.4	11.8	10.3	11.9
Dry extract at 100°, per 1000. .	19.74	28.68	17.84	23.35	14.50	21.00	18.60
Reducing substances, in glucose per 1000	1.41	4.34	1.85	1.07	1.78	1.85	3.42
Sulphates, in potassium sulphate per 1000	0.45	0.31	0.24	0.22	0.20	0.25	0.30
Potassium bitartrate per 1000 .	4.03	4.40	2.33	2.68	2.91	3.28	2.76
Mineral substances per 1000 . .	2.80	3.12	2.92	1.40	1.92	2.48	1.45
Total acidity, in H_2SO_4 per 1000 .	3.68	3.56	2.21	3.60	3.35	4.04	3.68
Volatile acidity, in $C_2H_4O_2$ per 1000	0.54	0.56	0.85	0.47	0.74	0.52	0.98

The district producing inferior wines is chiefly that known as the Coast Cordillera, which includes the provinces of Linares, Macule and Concepcion. Generally it is the hill slopes that are planted with vines ; these vineyards are not watered, as the rainy season in this part is prolonged till sufficiently late into the spring. French vines are here relatively rare, the old Spanish varieties being still cultivated. They yield larger crops than the French vines, but the wines made from their grapes are flat, without freshness or bouquet. Table III gives some examples of the composition of these wines. The samples were taken from new wines before the first racking.

Specialities. — To the north of Santiago, in the Provinces of Aconcuagua and Coquimbo, the crop is used for the elaboration of special products, " chichas ", liqueurs, raisins and brandy. " Chicha " is an exclusively Chilian product ; it is grape-juice concentrated at 12°, 13° and 14° Baumé by being placed over an open fire out of doors, and then left to ferment spontaneously. This agreeable beverage is sold when it sparkles slightly and has lost some of its sweetness, but has not yet acquired a high alcohol content. " Chicha " is made throughout Chile, but this northern zone with its different grapes (Alexandrian Muscats, white, yellow, rose, golden, and other Muscats, Torontes, etc.) produces a kind which is especially prized.

TABLE IV. — *Composition of Chichas.*

	Santiago	Buin	Naucagua	Cauquenes	La Calera
Density	1 036.4	1 057.5	1 027.6	1 040.0	1 080.0
Alcohol per cent. in vol. . . .	7.2	6.5	9.0	10.1	3.0
Dry extract at 100°, per 1000 . .	114.30	—	—	179.90	217.80
Reducing substances, in glucose per 1000	95.6	117.60	84.4	171.00	207.00
Glucose per 1000.	53.7	87.37	64.35	93.60	127.90
Levulose per 1000	41.9	30.23	20.05	77.40	79.10
Mineral substances per 1000 . .	2.24	2.32	2.10	2.06	7.62
Cream of tartar per 1000. . . .	3.13	4.12	3.73	4.78	6.51
Tartaric acid per 1000.	0.85	1.29	0.96	0.72	1.03
Total acidity, in H_2SO_4 per 1000	3.84	4.28	4.21	4.82	5.46

The sweet wines and liqueur wines produced in the Province of Coquimbo are not without their good qualities. Aromatic brandies known as "piscos" are also made in this district.

Raisins. — In Huasco and Elqui, raisins are made from Alexandrian Muscats grown on trellises on the slopes at an altitude of from 3 300 to 5 000 ft. The climate there is particularly dry and warm. The grapes are gathered when fully ripe. They are hung up in special rooms, where they dry by the action of the natural circulation of the air. In two months, the grapes are dry; they are then passed through boiling water for one or two minutes, and are subsequently drained, dried and packed.

Area under wines, and vine production. — The area planted in vines may be estimated at 250 000 acres; the vineyards are nearly equally divided into irrigated and non-irrigated plantations. The so-called native vines occupy a surface of 160 500 acres, as against 56 500 acres planted with French varieties. The average production is about 154 million gallons for the whole number of vineyards.

Consumption and exportation. — At the present time, the Chilian wines are mostly consumed in the country. But it is interesting to note that there is also a considerable exportation of liqueur wines to Germany. Wines of a good brand are those chiefly exported to Uruguay, Argentina, Peru, Bolivia and Brazil.

The value of the vines. — The value of the vineyards per acre, in the irrigated zones, amounts as a rule to from £80 to £128 according to the district, the quality of the soil, distance from the railway, etc. In non-irrigated zones, the value varies between £16 and £32.

1202 - **The Wines of Tokay and a Comparison with those of Sauternes.** — LABORDE, J. in *Revue de Viticulture*, Year 20, Vol. XL, No. 1024, pp. 129-135. Paris, July 31, 1913.

The temperate district of Tokay-Hegyalja, in Hungary, is noted for a very excellent liqueur wine prepared from more or less shrivelled grapes, not attacked by *Botrytis cinerea* ("Edelfäulniss" (1).

Producing district. — The district of Tokay-Hegyalja, the Côte d'Or of Hungary, is situated in the North-East of the kingdom in the County of Zemplén, comprising some 30 communes including these of Tokay; to these must be added one commune in the County of Abanj-Torna thus making 31 communes.

Tokay-Hegyalja is a range of hills extending from the extremity of the great plain of Hungary some distance from the Carpathians, for some 30 miles, and containing an area of 12 450 acres of land occupied by 5 708 cultivators.

The total production of this area averages about 1 760 000 gallons, and occasionally reaches 2 640 000 gals. Of this total only about one half to one third reaches the high quality required for export, and of the exported wine 95 to 98 per cent. is of the Szamorodni or Maslás brand; the Asszu wine makes up the remaining 2 to 5 per cent., the real essence of Tokay being very rare.

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(1) See No. 418 *B*. April 1913. (*Ed.*).

The principal vine grown in Hegyalja is the Furmint, of which there are several varieties, all thick-skinned fruit free from moulds and suitable for making dried grapes. Amongst the varieties of Furmint are the following: Raisin Blanc, Muscat Jaune (which gives the celebrated Asszu de Muscat), Lime Leaf, Goat's Udder. They all ripen early; in good seasons some grapes begin to colour at the end of July, and all are ripe in September.

All qualities of wine are made in this district, from the ordinary Tokay wines to the rare Essence.

Ordinary wines. — These are made from bunches containing no shrivelled grapes, or from which the shrivelled ones have been removed ; although ordinary table wines, they have a very rich flavour.

Essence of Tokay. — The shrivelled grapes are gathered separately and placed in a vat having a small outlet at the bottom ; through this flows out a very concentrated juice, obtained by the pressure of the grapes themselves. This juice gives the Essence of Tokay, which is very rich in sugar, but contains little alcohol ; in time it takes on a very marked aroma and an exquisite flavour ; it is always rare.

Asszu wine. — This is the best-known of the Tokay wines, and is much appreciated as a dessert wine. It is prepared from a mixture of shrivelled and unshrivelled grapes ; the greater the proportion of the former, the richer the wine. For a very sweet wine, 5 hottes (2 to 3 ½ bushels) of shrivelled grapes are added to one barrel (28 to 30 gallons) of must. Asszü wines are classed according to the number (2, 3, 4 or 5) of hottes of shrivelled grapes added to each barrel of must. The shrivelled grapes are first of all crushed alone in a vat and the resulting mass is thrown into another vat, mixed with the correct amount of must and stirred vigoronsly; it is set aside for 12 to 48 hours according to the temperature, after which it is put into bags, trodden, and pressed ; then the juice drawn off is put into casks.

Forditás. — The residue from the bags is placed in another vat and a further quantity of common must is added. After thorough mixing, the whole is left together for 4 or 5 hours, and is then put into bags and trodden. The residue is then pressed and a liquid obtained which produces a very good wine but of less value han Asszu.

Szamorodni Wine. — This is prepared from bunches whose grapes are partly shrivelled ; they are trodden in bags and treated in much the same way as for Asszu. The residue is used in the making of Forditás.

Máslás wine. — To prepare this, good Hegyalja wine is poured onto the lees remaining after drawing off the Asszü or Szamorodni wines. In this way the wine remaining in the lees is used to improve the ordinary table wines.

Composition of the Must and the Wine. — Table I gives the composition of a sample of 1906 must (density = 1,113) from the vineyard of Kincsen (Tolcsva).

TABLE I.

		Grams per 100 c.c. of must.
Extract		29.41
Reducing Sugar	levulose	13.46
	glucose	12.94
Total acidity (as tartaric acid)		0.80
Total tartaric acid		0.547
Acid other than tartaric		0.007
Cream of tartar		0.404
Tartrates of alkaline-earths		0.217
Ash		0.290
Phosphoric acid		0.069
Polarimetric rotation		12 12°

TABLE II. — *Composition of shrivelled grapes from the same vineyard in the same year.*

		per 100 kg.
Skins (moist)		5.633
Seeds		6.083
Water		6.083
Extract		63.550
Sugar	levulose	26.676
	glucose	26.299
Extract (sugar free)		10.299
Total acidity (as tartaric acid)		1.605
Free tartaric acid		0.00
Tartar		2.281
Ash		1.681
Phosphoric acid ($P_2 O_5$)		0.148

Fermentation of the Must. — The fermentation of the must in the Tokay Hegyalja districts, is generaly catried out in cold cellars, so that the musts of high sugar content ferment slowly. The wines are thus made slowly, and keep on improving in delivacy and aroma for years.

The Asszŭ wines of Tokay vary in colour from golden yellow to brown. They have a peculiar sweetness resembling that of honey, and very characteristic flavour and aroma. The Szamorodin wines are generally not sweet or only slightly so; they have considerable strength, a yellow or yellowish brown colour and a very characteristic flavour. They contain 13 to 17 per cent. of alcohol, while the Asszŭ wines, being much sweeter, contain only 10 to 13 per cent.

Comparison of the wines of Tokay with those of Sauternes. — Table IV gives the anlayses of representative types of the wines of Tokay and enables us to make comparisons with the white wines of Sauternes made by different methods.

TABLE III. — *Composition of wines of Tokay (Kramszky) in grams per* 100 *c.c.*

	Ordinary wine of Tokay-Hegyalja from Tarczal, 1901	Szamorodni from Sarospatak 1901	Asszú wine (5hottes) from Tarczal, 1901	Asszú wine (5hottes) from Tallya, 1890	Essence from Tolcsva, 1901
Alcohol: Volume per cent. .	14.39	14.77	12.23	13.13	7.11
Alcohol.	11.42	11.72	9.70	10.42	5.64
Acidity, total ($C_4 H_6 O_6$) .	0.76	0.94	0.96	0.62	1.23
Acidity, volatile ($C_2 H_4 O_6$)	0.13	0.10	0.15	—	0.21
Acidity, fixed ($C_4 H_6 O_6$) .	0.60	0.82	0.77	—	0.97
Extract	3.16	7.78	18.74	9.26	33.73
Reducing bodies	0.29	2.60	13.40	5.75	25.77
Levulose	0.16	1.82	6.85	2.88	13.90
Dextrose	0.03	0.68	6.45	2.77	11.87
Glycerine	1.08	1.48	1.80	—	1.45
Tartaric acid, total	0.28	0.19	0.19	—	0.15
Tartaric acid, free	0.08	0.00	0.00	—	0.00
Tartrates of alkaline earths.	0.07	0.16	0.13	—	0.05
Tartar.	0.16	0.04	0.09	—	0.13
Tannin.	0.02	0.015	0.03	—	0.024
Ash	0.16	0.185	0.24	0.20	0.30
Phosphoric acid.	0.028	0.042	0.062	0.045	0.041
Polarimetric rotation . . .	—0.14°	—1.38°	— 3.15°	—1.30°	—7.04°

Comparison of the Tokay wines with those of Sauternes. — The analyses of these various wines allow a comparison to be made between those of the Tokay district in general and the famous white wines of Sauternes, of which the method of preparation is quite different. Table IV contains analyses of some types making a series as similar as possible to the Tokay series in sugar and alcohol content. The figures refer to 100 c. c. of wine.

No. 5 is a "head wine", harvested under conditions quite analogous to those of the Essence of Tokay, and made from over-ripe grapes without any

TABLE IV.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Alcohol, volume per cent . . .	14.8	13.8	13.8	12.9	6.9
Reducing sugar	0.550	2.630	7.140	14.070	39.40
Extract at 100°	2.320	5.780	10.300	19.620	—
Extract, reduced.	1.840	3.250	3.260	5.650	—
Acidity, total ($C_4H_6O_6$) . . .	0.682	0.787	0.750	0.550	0.870
Acidity, volatile ($C_2H_4O_2$) . .	0.050	0.070	0.080	0.085	—
Glycerine	11.465	1.465	1.815	2.450	0.742
Proportion alcohol-glycerine . .	3.080	13.270	16.440	24.020	13.26
Cream of tartar	0.118	0.115	0.140	0.135	—
Ash.	0.325	0.455	0.500	0.500	0.530
Rotatory Power	—1	—1	—31	—73	—

appreciable action of *Botrytis*, that is simplyshrivelled. (1) No. 4 is a "head" wine harvested in the same year with a very pronounced development of the fungus. Nos. 2 and 3 are " middle " wines and No. 1 a " tail" wine, all of good years.

Comparing the figures of the two tables, it is seen that in the Sauternes wines with equal or higher sugar content, the alcohol content is greater than in the Tokay wines; the initial sugar content of the must must therefore have been greater also ; for No. 5 this figure works out at 50 gms. per litre, whilst for Essence of Tokay it is about 370 gms., or about the same as Sauternes wines from grapes attacked by *Brotrytis*.

The fact that the fermentation goes equally far, and sometimes further, at Sauternes than at Tokay, in spite of the excess of sugar, is probably due to the warmer autumn in the Gironde.

The acidity of the two wines shows little difference, but it is generally somewhat less in the Sauternes. This is chiefly a question of the variety, though increased by the neutralizing action of the *Botrytis* rot.

In both cases the reduced extract is very high, and glycerine forms a considerable part of it. The proportion of glycerine per 100 of alcohol varies from 10 to 25 and this ratio varies directly with the quality of the wine, except in the case of exceptional wines like Essence of Tokay.

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(1) The year 1893 was very dry right on to September, and the *Botrytis* rot had not appeared by the time the grapes for this wine were gathered.

The writer explains the large amount of glycerine in Sauternes wines, firstly by the presence in the must of ferments capable of producing considerable quantities of glycerine, especially when acting in very concentrated musts; and also because, before fermentation begins, more than 1 per cent. of glycerine is found in the musts, which must have been produced by the action of *Botrytis cinerea* on the sugar of the grape.

The Tokay wines are richer in tartaric acid than the Sauternes, because the latter are more alcoholic, and *Botrytis cinerea* neutralises some of the acidity of the fruit.

A more obvious difference exists between the ash contents, those of the Sauternes being twice as great as the Tokay figures. One of the most important influences in this direction is the concentration of the juice of grapes attacked by *Botrytis*, which is greater than when they are simply shrivelled.

Again a very noticeable difference is accounted for by the use of sulphurous acid. The sulphurating of the stock is an indispensable operation in the vinification of Sauternes ; and it is owing to the presence of sulphurous acid that the wines acquire and retain their wonderful properties. The addition of sulphurous acid to the Tokay wines in sufficient quantity would cause serious inconveniences, since the development of the aroma in the wine is dependant on energetic oxidation, which would be hindered by the presence of sulphurous acid.

Of the French wines, those of Montbazillac have most resemblance in aroma, taste and colour to the wines of Tokay.

1203 - **Influence of Ferments on the Variations in Dry-Extract and Glycerine in Wine.** — VENTRE, J. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol 157, No. 4, pp. 304-307. Paris, July 28, 1913.

During a course of researches carried out with the object of ascertaining the action of some elliptical ferments on the general constitution of wine, the writer was surprised to find that the ferments do not all behave in the same manner towards the extractives of grape must. His experiments lead him to the following conclusions:

1) Every ferment has a specific action on the extractives contained in the must. Some, the Champagne ferment in particular, seem to produce a sensible diminution in the dry extract, comparable with the dilution produced by certain ferments in brewing. The Médoc ferment on the contrary always gives a greater proportion of dry extract, without there remaining in consequence non-utilized reducing matter in the medium.

2) It would be interesting to know the variety of yeast which has transformed a must into wine, especially for research in adulteration by addition of alcohol ; it would suffice if this attenuation of the dry extract corresponded to a high degree of alcoholic strength for the wine to be declared as one containing added alcohol.

3) The addition of sulphurous acid to the must diminishes to a great extent the attenuating power of certain ferments, especially that of Champagne.

The writer proposed to investigate the cause of this diminution of dry extract and was led to determine the glycerine, with the following results:

a) Glycerine of organic origin is closely dependent on the ferment acting on the medium. The proportion of glycerine formed varies between 3.2 and 4.1 per cent. of the initial weight of sugar in white wines, and between 3.6 and 4.2 for red wines.

b) In media to which sulphurous acid has been added, the quantities of glycerine produced were sensibly the same in all the experiments, whichever ferment was used. The proportion varied between 3.53 and 3.7 per cent. for white wines and 3.5 and 3.68 for red wines.

c) The variations of glycerine in the same medium are, according to the author's experiments, less than those found by M. Laborde, who reports considerable variations, according to the ferments, namely 2.5 to 7.75 per cent. of the weight of transformed sugar.

BREWING AND DISTILLING

1204 - **Plum Brandy. Improvements in its Manufacture.** — ELLRODT, G. in *Zeitschrift für Spiritusindustrie*, Year XXXVI, No. 30, pp. 373-374 + 2 figs. Berlin, July 24, 1913.

Plum brandy is manufactured in the Southern States of Germany, chiefly by small farmers who frequently possess only small badly equipped distilleries.

The raw material consists of the fruit of different varieties of long plums (Zwetschen or quetsches, fruits of *Prunus domestica* and *P. œconomica*) and also the different varieties of round plums (Pflaumen). The taste of the product depends chiefly on special aromatic substances in the fruits, on the content of amygdalin and on the method of preparation. The content of sugar, the most important constituent in distillation, varies much according to the variety of fruit and the degree of maturity. According to König it varies between 6.44 and 25.62 per cent. and averages 14.71 per cent. The yield of alcohol varies considerably in consequence, and also on account of different methods of manufacture, which in some distilleries have remained unchanged for a century. The fruit is generally crushed, stones being left intact in two-thirds of the mass, crushed in the other third. In several districts however this last operation is not practised.

The crushed fruits are placed in barrels or cement troughs and allowed by means of the ferments adhering to the fruit to ferment spontaneously. Lactic and acetic acid bacilli also develop in the mass and may check the development or even destroy the natural ferments of the fruit by an excessive production of acid. The result is that the fermentation of the sugar is incomplete and that a portion of the alcohol is transformed into acetic acid if the fermented mass is kept any length of time.

Experiments have been made to accelerate the fermentation by the addition of beer yeast and to check the bacterial action or diminish its effects. All these experiments gave increased yields of alcohol, but the quality of the final product was inferior to that produced by normal fermentation. Some distillers have used compressed yeast. Better results might be obtained by the use of wine ferments in place of beer yeast either fresh or compressed.

The enormous loss of alcohol which may result from spontaneous fermentation has been ascertained by experiments made at the Distillery Institute (" Institut für Gärungsgewerbe ") at Berlin. The distiller who brought material to the Institute complaind that the yield of alcohol was exceptionally small without apparent reason.

It was found that a good deal of fallen fruit was used in the preparation of the must, with the result that a much greater number of microorganisms were introduced into the liquid, thus incresing the danger of infection.

Analysis of the must gave the following results.

TABLE I.

Density of fermented must	6.6° B.
Acidity	5.46°
» as acetic acid	1.638 gm. in 100 c. c.
Alcohol in filtrate	5.1 per cent. by volume
Unfermented sugar	0.6 per cent.

Calculating the quantity of acids corresponding to 100 c.c. of alcohol, the exceptionally high figure of 32.11 gms. is found. Allowing for the acid already present in the sweet must, which is not inconsiderable, there remains a loss of about 20 per cent. of the total sugar due to the formation of acid.

Microscopic examination showed that the lactic and acetic acid organisms were numerous and fully active and that the ferment had been destroyed some time. To the loss of alcohol due to fementation, the loss due to distillation must probably also be added, because in some cases the apparatus used was very defective and often without an agitator. In this case, in order to prevent the fermenting mass from sticking to the walls of the still and burning, it is necessary to open the still in order to stir up the contents, which results in a considerable loss of alcohol. Also the means of determining the end of distillation is often so unsuitable that frequently alcohol remains in the residue.

Considering the high acid content of the fermented must, the writers obtained from the distiller samples of the first distillation (crude product), and of the second distillation (rectified) and tailings of the refined product (l'eau-de vie fine). The analyses are given in Table II below.

These results show that only a very small proportion of the enormous quantity of acid in the fermented must passes into the rectified product. Whilst the fermented must contains 36. 04 gms. of acid per 100 c. c. of

TABLE II.

	Eau-de-vie crude	Eau-de-vie rectified	Tailings
Results obtained:			
Specific gravity at 15° C.	0.978 226	0.927 230	0.980 778
Percentage of alcohol in volumes determined with the alcoometer . . . . %	17.7	54.36	15.34
Acids, as acetic, in 100 c. c. . . . . . . gms.	0.216	0.066	0.135
Index of total ethers.	20.1	38.3	6.0
» » volatile »	18.6	38.3	6.0
» » fixed »	1.5	—	—
Hydrocyanic acid, free. . . . . mgm.	traces	0.75	0.5
» » combined	1.25	2.50	—
» » total	1.25	3.25	0.5
Furfurol reaction	present	present	present
Results calculated per 100 c.c. of absolute alcohol:			
Acetic acid . . . . gm.	1.121	0.121	0.814
Index of total ethers.	113.5	70.04	39.1
» » volatile »	105.0	70.04	39.1
» » fixed »	8.5	—	—
Hydrocyanic acid, total . . . . mgm.	7.06	5.97	3.26
» » combined	7.06	4.59	—
» » free	—	1.38	3.26

alcohol, the crude spirit contains 1.40 gm. and the rectified spirit 0.121 gm. Of the ether which has passed into the crude product, none of the fixed substance and only a portion of the volatile, passes into the rectified liquid. Only combined hydrocyanic acid is present in the crude spirit and a small quantity of the free acid in the rectified product, and the free acid alone in the tailings. This suggests that a hydrolysis of cyanide compounds takes place during rectification, and explains why different investigators have not been able to demonstrate the presence of free hydrocyanic acid in plum brandy, because the quantity probably depends on the degree of rectification to which the liquid has been subjected.

In conclusion, only a small part of the great quantity of acids produced by foreign organisms during fermentation finds its way into the rectified brandy. There is no definite ratio between the formation of ethers and that of acids. In avoiding the development of acids by means of pure ferments, as frequently practised of late, there is no risk of producing an inferior brandy. In fact it is probable that the use of pure ferments of superior wines (which impart to their products a fine characteristic aroma) would improve the quality of the brandy: at any rate the yield would be considerably increased.

PLANT DISEASES

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

1205 - **The First International Conference of the "Defensa Agricola" at Montevideo** (1). — Conferencia Internacional de Defensa Agricola. — *República Oriental del Uruguay, Revista del Ministerio de Industrias,* No. 1, May 1913, pp. 77-84, 1 plate. Montevideo, 1913.

On the initiative of the Government of Uruguay, the First International Conference of the "Defensa Agricola" was held at Montevideo from May 2 to 10, 1913. The Ministers of Foreign Affairs and of Industries of the Republic were Honorary Presidents (their delegate, Dr. Ed. Acevedo, being Acting President). The following States of South America were represented by their delegates and by experts: Argentina, Colombia, Chile, Paraguay, Brazil, Ecuador, Bolivia, Peru and Uruguay.

The text is given of the three Conventions drawn up by a technical commission and approved in final form by the International Conference. The first Convention consists of 15 articles, and deals chiefly with the damage caused by the locust *Schistocerca paranensis*. It arranges for an International Commission to be held before August 25 at Asunción, Paraguay; the objects of the latter are to study the centres of distribution and the concentration and diffusion zones of this locust and to propose (if it appeared necessary after a prelininary enquiry) the creation of a Central International Station with sub-stations for the purposes of *a*) determining geographically the concentration zones of *Schistocerca paranensis*; *b*) elaborating and presenting a control system suitable for the concentration zone, and (after the acceptance of this system) the directing of the necessary operations; *c*) informing all the countries interested of the movements of the swarms in order that they may take the necessary measures; *d*) drawing up and distributing frequently to the respective Governments reports on operations carried out, and upon everything which can be tried for the destruction of this injurious insect.

Matters relating to the pecuniary assistance and the reciprocal collaboration of the various contracting States were also settled, in so far as these concerned the working of the International Commission, the found-ing and work of the Stations, the carrying out of a common control system, the organisation of a service of telegraphic information respecting the migrations of the locusts, and the exchange of information at the close of every season.

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(1) See also No. 183, *B*. Feb. 1913. (*Ed*.).

By the provisions of the second Convention, which consists of 10 articles, the contracting States undertake to establish inspection services in their respective territories for the purpose of defending the interests of agriculture against plant pests. The latter are defined as follows : parasites, weeds, injurious birds and other animals, and all causes of pathological conditions, or of injury caused by cryptogams, insects and other animals, when they have assumed or threaten to assume a propensity for spreading likely to cause serious damage to plants.

As a result of the creation of the above-mentioned services, and for the purpose of the export, import and transit of agricultural produce, the States undertake to declare which ports are open to such importation and to fix the measures of control to which these products will be subjected; they undertake to authorize no despatch of goods to the signatory countries, unless the prescriptions of the inspection services of the said countries have been carried out, and only to accept certificates given by official agents. The States will advise one another as to the officials authorized to issue such certificates, and respecting any modifications and changes in the latter. These certificates should contain a declaration that the original plantation or nursery is free from disease, and give the name of the owner or occupier of the land, its situation, the number and species of the plants, the port of loading and unloading and the name and address of the consignee.

Further, the States are expected to communicate to one another the laws and regulations on the inspection service and any modifications of the same, likewise the existence and development of diseases, the occurrence of new diseases, and the disappearance of those already known, as well as every occasion of the refusal or destruction of imported products, giving the origin of such products, and the reasons necessitating the measures in question.

The second Convention also fixed that the second International Conference of the " Defensa Agricola " should be convoked and organised by the Argentine Government, and held at Buenos Ayres. In conclusion, it provided for the installation at Montevideo of a permanent International Bureau, (" Officina "), entrusted with the supervision of the execution of the decisions made, and to serve as an intermediary between the different bureaus or " Officinas tecnicas de Defensa Agricola " of the various adhering countries. This Bureau will consist of an agricultural engineer chosen by the Uruguay Government, and of diplomatic representatives of all the countries of South America already accredited to the Government of that Republic. The working expenses will be divided proportionally among the contracting countries. The directing Committee of the Bureau will draw up the regulations.

The third Convention announces in the text that: On the denunciation or request of any one of the Governments, the other contracting countries shall be obliged to take prohibitive measures against the importation of easily-propagated diseases which are unknown in the producing signatory countries, and this so long as they occur in the said countries, and provided there are no practical measures of efficaciously disinfecting the substances which may convey the said diseases.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN

1206 - **The Cause Determining the Chlorosis of American Vines and the Method of its Control.** — ACCARDI, SALVATORE. *La clorosi delle viti americane*, 10 pp. Naples, 1913.

Chlorosis, especially in the case of American vines, may be transitory, if it depends on cultural defects, or permanent, if it is due to the composition of the soil. Temporary chlorosis may be treated by abundant manuring. Permanent chlorosis, in the opinion of the writer, should be mainly attributed to an insufficient absorption of magnesium on the part of the plants.

Magnesium is not wanting in any soil, but the carbonic acid circulating with the water in the soil dissolves with difficulty the double carbonate of magnesium and lime (dolomitic). When the magnesium occurs in this form, if any plant has not the power of directly decomposing this compound by means of the acid contained in its roots, it is deficient in the amount of magnesium necessary for the formation of its chlorophyll; hence the development of chlorosis.

The analyses made by Averna and Rossi show that Berlandieri and its hybrids contain more acid than Rupestris and Riparia, and also that the Berlandieri group has a greater power of decomposing the double carbonate of lime and magnesium than that possessed by other American vines; it is to this circumstance that it owes its chlorosis resistance (1).

Since however, according to Comes (2), nitrogenous substances in general, and manure in particular, diminish the acidity of the sap by forming a larger amount of oxydases, especially in warm soils, it follows that soils which produce permanent chlorosis must never be treated with any kind of nitrogenous manure. Phosphates (which maintain the acidity) should be used, together with such quantities of magnesium as are proved necessary by local experiments.

In conclusion, it should be noted that though ferrous sulphate is a useful remedy for temporary or transitory chlorosis, it is of little efficacy in the case of permanent chlorosis, owing to its weak action in displacing magnesium on being applied to the soil, and its slight and momentary catalytic effect when it reaches the chlorotic leaves.

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(1) See No. 495, *B*. March 1912; No. 788, *B*. July 1913. (*Ed.*).

(2) See No. 881, *B*. July 1913. (*Ed.*).

1207 - **On the Presence of Endocellular Fibres in Healthy Vines and in those attacked by « Bramble-leaf ».** — MAMELI, EVA in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Series 5, Vol XXII, First Half-year, Part 12, pp 879-883. Rome, 1913,

In this preliminary note, the writer, basing her remarks on the results of studies made upon healthy and infected American and European vines, states that the presence of endocellular fibres, which is considered by Petri (1) as the "constant index" of the "bramble-leaf disease" ("roncet" "courtnoué", etc.) is not in her opinion "a symptom which is closely connected with the actual cause of the disease". Such fibres occur frequently, according to the writer, in healthy American and European vines, as well as in conifers and other plants, as has been demonstrated by Sanio, Kny, Muller, Raatz and Penzig.

In healthy vines, the writer states, the endocellular fibres occur equally in the higher and lower portions of the plant, and are found as frequently in the lower internodes as in the upper ones; while according to Petri "these anomalies occur in the upper internodes only in plants which have long been affected", and "when the fibre formation takes place at the same time at the summit and base of the plant, the injury is more rapid and more serious".

BACTERIAL AND FUNGOID DISEASES.

FUNGI

1208 - **Recent Researches on Vine Mildew *(Plasmopara viticola)*.** — Communicated by DR. GY. DE ISTVÁNFFI, *Professor at the University, Director of the Royal Hungarian Ampelological Institute, and* GY. PÁLINKÁS, *Assistant.*

1. *Delopment of mycelium and conidia.* — The germinating tube of the zoospores of *Plasmopara viticola* always penetrates the green parts of the plant through a stoma; in the cavity below the stoma the hypha swells considerably and the whole of the protoplasm collects in this swollen part: the secondary spore thus produced soon throws out a haustorium, which penetrates the nearest cell of the parenchyma, and then develops a narrow tube (3 to 5 μ), which ramifies in the intercellular spaces and produces fresh haustoria. By the third day a definitive mycelium is formed. As the zoospores send out hyphae which penetrate several stomata, each "grease spot" is caused by as many young mycelia as the zoospores which succeeded in entering. The growth of the hyphae is generally in a radial direction and obstructions such as vascular bundles are met with by a flattening out of the hypha and the development of narrow hyphal threads which pass above or below the vein and continue their way as before.

The mycelial threads may take the form of 1) cylindrical tubes, sinuous and narrow-walled; 2) vesicular tubes with irregular swellings (during damp weather: coralloid type); or 3) slightly flattened tubes often tapering and with irregular dichotomous branching. The hyphae are always aseptate and never join together. The nuclei (1.5 to 3 μ) are numerous and scattered irregularly; they form clusters at the bases of the branches and at the tips of the young hyphae. Generally they are round, but when developed rapidly they become fusiform in shape.

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(1) See No 968, *B*. June 1912, No 1349, *B* Sept. 1912, and No. 67, *B* Jan. 1913 [*Ed.*].

The haustoria occur irregularly and are sometimes united in groups. Haustoria with long pedicels were previously unknown. They also possess a nucleus, which ultimately divides.

After the mycelium has developed, it sends out smaller filaments into the stomatic chamber, which form conical masses and raise the surrounding tissue. Under favourable conditions (heat and sufficient moisture) thin filaments from these hyphal masses pass out through the ostiole of the stoma, become swollen and present the appearance of young conidiophores, either, 1) isolated, 2) joined together in a strawberry-like mass, or 3) with the extremities forming pear-shaped swellings which give rise to conidiophores. When these filaments begin to extrude, the nuclei advance in quantities, and the dense protoplasm containing them passes into the branches.

After a short period of growth a slight swelling appears just below the tip, and into it the protoplasm condenses. At the time of migration the nuclei are in a rapid state of division and are fusiform, elongated or horseshoe shaped. In the course of the development of these swollen parts (which represent the stems of young conidiophores), appear first primary and later secondary branches which terminate in trifid sterigmata. (At the base of these branches we have observed finger-like bodies, hitherto unknown, which are probably rudimentary sterigmata). Fructification begins immediately, the first conidia forming after 4 to 6 hours on the sterigmata of the lower branches. Under favourable conditions fructification is completed within 10 or 12 hours.

We have observed by staining that the first protoplasm to pass from the sterigma to the young conidium is not very dense; it is followed by a denser part, generally containing the nucleus. This nucleus then divides several times. In the development of the conidia there are three distinct periods: 1) the conidium has reached its full size and the nuclei begin to divide, though the conidium is not ripe; 2) after 3 or 4 hours from the appearance of the young conidia karyokinesis ceases; the conidia are half ripe and if placed in water cannot produce zoospores for a long time; 3) the protoplasm takes the form of a network, the nuclei take up definite positions, and the conidia become fully matured. These facts account for the variation in virulence and the numerous differences recorded by various observers concerning the liberation of the zoospores.

The practical importance of this is that the conidia only become virulent after a period of about 24 hours. Thus it follows that the conidia produced in the morning after evening rain, cannot produce infection unless rain also falls during the afternoon or night following. Thus fresh infection may be avoided by spraying immediately. With a mist the conidia may begin to germinate even before dropping from the conidiophores, which explains why mists are so harmful.

We have already (1911) described the cover or lid of the conidium. During germination this lid is forced up by the zoospores, which then effect their escape.

At a temperature of 6° to 8°C. they maintain their vitality for 3 to 8 weeks, but do not survive drought for more than 5 days; dry weather following abundant rain is particularly destructive of thin-walled conidia.

In studying the effect of copper salts, we find, 1) that a solution of 1 in 1 600 000 of copper sulphate hinders germination, but that the conidia can germinate in a solution three times as concentrated as that indicated by Millardet and Gayon ; 2) that in the most dilute solution the formation of zoospores is considerably retarded (as much as 12 hours).

In artificial media the development of zoospores ceases at the time of liberation from the conidia, which has been observed to take place after 2 to 6 hours in the different solutions employed (bouillon, sweet wort, liquid manure, hay extract, etc.), diluted from 5 to 10 times.

2. *The period of incubation.* — This is defined as the period between the attack of the zoospores and the appearance of the first symptons of the disease on the plant (grease-spots on the leaves; yellowish-brown spots on the bunches, tendrils, etc.).

The length of the incubation period depends on the temperature and humidity of the surroundings ; for leaves it diminishes as spring advances; from the beginning to the middle of May it is 15 to 18 days ; at the end of May, 12 to 15 days ; at the beginning of June, 11 to 13 days ; at the middle of June, 9 to 11 days ; at the end of June, 6 to 7 days; and in July and August 5 to 6 days, provided the weather is normal.

On the bunches the duration of incubation varies as follows : from the end of May to the beginning of June, 12 to 14 days ; at mid June, 9 to 11 days ; at the end of June, 10 to 12 days ; in July 12 to 14 days. It is longer by 3 to 5 days if the infection takes place on the stalks of the grapes or on the main stalk of the bunch, as in this case the mycelium has to traverse the intermediate tissues, so that in July the period of incubation may be from 17 to 19 days.

During warm weather the incubation period may be so much shortened, after abundant rain, that the grease-spots do not show before the mildew breaks out. In this case the period of incubation on the leaves is 10 to 12 days at the end of May, 8 to 10 days at the beginning of June, 6 to 8 days from mid June to the end of the month and 4 or 5 days in July and August ; on the branches it is 9 to 11 days in the first half of June, 7 to 9 in the second half and 8 to 10 days in July. In such cases the vine growers believe that infection takes place during the rain on the day previous to the appearance of the mildew. This idea is erroneous, as infection always takes place 4 to 6 days sooner, and rain immediately before the appearance of the symptoms of disease has only the effect of reducing the period of incubation.

3. *Grease spots.* — These are the yellow or pale green transparent spots which appear on the green parts of the diseased plant immediately after the development of the mycelium, owing to destruction of the chloroplasts. On the fruits and old shoots the point of infection assumes a greyish or

brownish tint. The true "grease spot" appears along the edges and veins of the leaf.

The shape and size of the spots depends generally on the weather, the variety and the growth of the leaves; in cold or wet weather the spots are large and round; with drier weather they are smaller and more angular; on susceptible vines they are larger than on resistant varieties. After the appearance of the spots the first rain starts the development of conidiophores, which form the mildewed appearance on the diseased patches. The formation of the mildew is dependent upon the humidity; in dry weather it takes from 4 or 5 days to 12 or 20 for its appearance, and if there is no dew at night it may not appear at all.

4. *Infection experiments.* — All the young and green parts of the vine (including leaves half an inch in length) can be infected in the laboratory as well as in the open air. The success of the infection depends upon the state of the plant, the virulence of the conidia and the local conditions. Infection can be produced on the surface of the leaf, but only along the larger veins and indentations. The susceptibility of the plant depends upon the supply of water in the organ, the vapour tension in the stomatic chambers and intercellular cavities generally, the turgescence of the cells, and to some extent on the chemical composition of the cell sap.

In June 1911 we carried out artificial infection experiments on the bunches in the open air and described them in August of the same year. We found that infection rarely takes place on fruits the size of a pea, because of a suppression of some of the stomata.

By means of conidia preserved for 3 weeks in an ice-room (at 6° to 8° C.) we have been able to cultivate the fungus throughout the winter on forced branches; by retarding the appearance of the mildew we have succeeded in preserving the mycelium in the "grease spots" in a latent condition during 7 or 8 weeks. Under suitable conditions of warmth and humidity the incubation period is the same under glass as in the open.

5. *Bearing of the incubation period on practice.* — Attacks of mildew take place after rain, thick fog or heavy persistent dew; the appearance of the mildew also occurs after rain; consequently the development normally depends on two rainfalls. It is therefore necessary to apply the sulphate at least after the appearance of the grease spots.

To detect the presence of the grease spots, before their appearance in the vineyard, the suspected leaves are first sprinked with water and then covered up and kept in a warm dark place. The bunches are wrapped up in moist filter paper and placed in a warm damp chamber. After a few days the mildew breaks out on the suspected material and the disease is easily recognised.

6. *Use of the incubation calendar and trials.* — The grower should note any appreciable rainfall (say half an inch) between the end of April and the beginning of May and allow for the incubation period 15 to 18 days. This gives the date of appearance of the grease spots due to infection from winter spores. He must also notice if the temperature falls below 10°C. (50°F.), as the disease cannot develop below this temperature. The artificial for-

cing should be made 5 or 6 days and again 2 or 3 days before the expiration of the date of incubation (with both leaves and fruits).

In calculating the date of incubation, only the rainfall of two or three days duration may be taken together and the period must be reckoned from the first day of rain. From mid-June onwards even small showers must be reckoned. Heavy showers are the most dangerous, and it is then that the bunches require attention.

1209 - **Conditions Favourable to the Development of Mildew.** — MENGEL, O. Evolution du Mildew suivant les Conditions de Milieu. — *Comptes Rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, Second Half-Year, Vol. 157, No. 4 (July 28, 1913), pp 292-294. Paris, 1913.

From observations made in France it appears that infection by mildew is due to *a*) general causes; *b*) secondary causes depending on the nature and vitality of the vine, and on its adaptation to local conditions, such as the composition and exposure of the soil; *c*) accidental causes (such as manure, tillage, drainage of the soil, etc.).

As the general causes are bound up with atmospheric variations, meteorological observations are required to provide warnings and timely information. Preventive measures can always be successful in normal years when periods of infection do not overlap each other, as happened this year at Roussillon (Pyrénées Orientales).

For secondary and accidental causes, it is necessary to make researches into the variations in the development of the disease. For example, the variety Grand-noir will remain free from disease though surrounded by the Carignan variety badly infected; and the Carignan of Salanque (1), growing in soil of normal humidity, will be protected from infection by treatment with copper sulphate, owing to its adaptation to the local conditions, whilst the upland variety of Carignan, growing in soil accidentally inundated, would require double the treatment.

Since the spores of mildew, like those of all Phycomycetes, are disseminated by the least breath of wind, one would expect to find them in sufficient numbers to cause infection in any position. The writer has sufficient evidence for believing that a district previously infected with the disease is not more liable to infection than any other, provided that the local conditions previously favourable to the development of the disease no longer exist. Nor does he think that a hill-side situation is more liable to infection when it faces winds coming from previously infected areas. Further, in Roussillon this year the prevailing winds during the infection period came from the sea and the most badly mildewed districts were precisely those which were exposed to these sea breezes almost free from contamination with spores; this is accounted for by the writer as being due to the warm damp breezes accelerating the germination of the spores; no doubt a more rigorous treatment with the fungicide would have kept it in check.

The vine-grower should therefore be acquainted with the modes of action of these secondary and accidental causes and be able to act accordingly. It is well known that tillage during the period of infection is disastrous; consequently this operation must be postponed, or if urgently needed, a dressing of sulphate of copper must follow immediately behind the plough. In manured vineyards it will be advisable to double the treatment or to partially defoliate the plants to let more air into the bunches. In this way the accidental causes are prevented from creating local conditions similar to those of the general causes.

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(1) Coast plain of the Pyrénées Orientales. (*Ed.*).

MEANS OF PREVENTION AND CONTROL

1210 - Comparative Spraying Experiments with some Commercial Fungicides.

— BRETSCHNEIDER, ARTUR. Vergleichende Versuche mit einigen Spritzmitteln gegen die Blattfallkrankheit (*Peronospora viticola* De Bary) des Weinstockes. — *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 6, pp. 718-725. Vienna, 1913.

In 1912 comparative experiments were carried out in various parts of Austria with Bordeaux mixture (1-2 per cent.) and the following commercial fungicides: "Floria-Kuperseifenbrühe" (3 per cent.), "Forhin" (1-2 per cent.; but the formula does not correspond with that given by the makers), and "Perocid" (1-2 per cent.), chiefly against attacks of vine mildew (*Plasmopara viticola*), but also (at Znaim) against *Pseudoperonospora cubensis* on Cucurbitaceae and certain fungi on fruit trees (*Fusicladium*, *Monilia*, etc.).

The wetting power of all these preparations was found to be very good. The writer does not consider the visibility of the spray on the leaves very important; for this point Bordeaux mixture comes first, followed in order of merit by "Floria-Kupferseifenbrühe", "Perocid", and "Forhin". For rapidity of preparation, the order is: "Floria-Kupferseifenbrühe", "Forhin", "Perocid". All the solutions were neutral and harmless to plants, with the exception of "Forhin" on one occasion, and they had advantages over Bordeaux mixture in being ready for immediate use and not requiring testing for neutrality. They were also generally in a very fine state of division. Bordeaux mixture at 2 per cent. alone gave thoroughly satisfactory results in 1912 as a fungicide. With all the other preparations the mildew developed more or less vigorously. Arranged in order of merit with regard to their fungicidal properties they are as follows: Bordeaux mixture at 2 per cent., then at some distance Bordeaux at 1 per cent., "Forhin", "Floria-Kupferseifenbrühe" and "Perocid". The inferiority of the last-named mixture is due to the low concentration of the liquid.

"Floria-Kupferseifenbrühe" and "Forhin" are the most expensive and "Perocid" the most economical in price.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

1211 - Some Interesting Cryptogamic Diseases which Appeared in Hungary in 1912.

— PATER, B. Mykologisches aus Ungarn. - *Zeitschrift fur Pflanzenkrankheiten*, Vol. XXIII, Part 5, pp 260-262. Stuttgart, August 20, 1913.

The year 1912 was the most favourable for the development of cryptogamic diseases which can be remembered in Hungary. The writer, who carried out some researches at Klausenburg (Kolozsvár), records from this place eight species of fungi, all interesting from different points of view.

1) *Puccinia graminis ;* this appeared for the first time on rye, after the writer had sought for it in vain for about 20 years ; the harm caused was, however, not great.

2) *Puccinia Malvacearum,* also observed for the first time, on marsh mallow (*Althea officinalis*). It attacked, but only slightly, plants of one year of age ; those from 4 to 5 years old were immune.

3) *Epichloe typhina,* already recorded before 1912 as occurring on *Agropyrum repens ;* this fact is doubly interesting, because on the one hand the fungus had not yet been registered in the literature on the subject, and on the other, the parasite proved useful in arresting the development of the weed, preventing it flowering and fruiting.

4) *Puccinia bullata,* very common on cultivated specimens of *Conium maculatum* as in 1911 ; the uredospores appeared in May, and the teleutospores during the second half of August, not only on the stems and leaves, but also on the inflorescences.

5) *Plasmopora nivea* on the same plants of *Conium* ; wild individuals of this Umbellifer growing close to the cultivated specimens remained entirely immune, and as the latter were growing in rich well-manured soil, it appears that their excessive vigour rendered them more susceptible to the attacks of the disease.

6) *Phoma foeniculina,* very common on fennel, as in 1911 ; the infected plants bore smaller and fewer seeds than the healthy ones.

7) *Puccinia Menthae* on *Mentha canadensis* var. *piperascens.*

8) *Oidium quercinum* on oaks ; these have been attacked by the fungus since 1910 ; the old trees were immune.

1212 – ***Sclerotium Oryzae* on Rice in India.** — SHAW, F. J F. A Sclerotial Disease of Rice — *Memoirs of the Department of Agriculture in India*, Vol VI, No 2, pp. 11-23, 1 fig., plates I-III. Calcutta, July 1913.

Sclerotium Oryzae was first described by Cattaneo in 1879 as damaging rice in Novara and Lombardy. It was discovered in Japan in 1910 by Miyake and during the past year it has been found in various parts of India.

Infected plants can be distinguished from their healthy neighbours by abnormally prominent tillering, a fact that appears to have been overlooked by previous workers. Later the infected culm gradually turns yellow and dies and the ears are poorly developed and empty. Within the hollow stem at the base a dark greyish web of hyphae is visible with small black sclerotia dotted over the surface.

The writer describes his preparations of the fungus in pure culture and its appearance on various media. Inoculations of the pure cultures on sterile seedlings gave positive results.

The author concludes by pointing out the differences between his observations and those of previous workers on allied species and draws attention to the interesting changes in colour and form of the hyphae grown in the different media.

Remedial measures against such a parasite as this do not appear to be practicable, and the writer suggests the breeding of resistant varieties as the only method of dealing with the disease.

1213 – ***Lasiodiplodia Theobromae*** **parasitic on Cacao in Dahomey.** — BERTHAULT, PIERRE. Sur une maladie du Cacaoyer dans l'Ouest Africain — *L'Agronomie Coloniale, Bulletin mensuel du Jardin Colonial, Nouvelle Série,* Year 1, No. 1 pp. 8-14, figs. 1-3. Paris, July 30, 1913.

The cacao plantations in Dahomey have been ruined by a disease known locally as " sun-stroke " or " apoplexy ", which attacks the root, trunk and branches and destroys in a few days otherwise healthy and productive trees. As a result of his examination of the disease the writer concludes that it is due to a parasite, *Lasiodoplodia Theobromae* (Pat.) Griffon et Maubl. (1).

He suggests experiments to test the efficacy of copper mixtures and lime-sulphur, and disinfection of the soil by carbon disulphide injections. Further studies on this subject are required.

1214 – **" Soft Rot " of Bulbs of *Ixia maculata* and *Gladiolus Colvillii* produced by *Bacillus Ixiae* n. sp. and *Pseudomonas Gladioli* n. sp.** — SEVERINI, G. Una bacteriosi dell'*Ixia maculata* e del *Gladiolus Colvillii*. — *Annali di Botanica,* Vol. XI, Part 3, pp. 412-422, plate VIII. Rome, 1913.

In April 1912, the writer observed a soft rot on bulbs of *Ixia maculata* and *Gladiolus Colvillii* resembling a bacterial disease. All the plants (from bulbs obtained from Holland), though grown in quite separate frames, showed signs of the disease simultaneously, at the time of appearance of the first blooms.

The symptoms of attack begin with a yellowing of the tips of the leaves extending longitudinally to the base, and finally the whole leaf turns yellow. Livid purple spots then appear, quite distinct at first, but later changing into a greyish black mass. The whole shoot is easily detached from the bulb, and may fall to the ground of itself. On superficial examination, the bulb appears normal, but within the outer sheath it is covered with yellow or reddish spots and is found to be flaccid and full of a soft granular mass. The disease attacks young bulbs equally with the old ones.

The writer has obtained pure cultures of the organisms present in the diseased tissue, and out of five bacteria which he isolated he found that three were capable of producing the disease by artificial infection. One of these organisms occurred on *Gladiolus* and the two others proved to be one species capable of producing the disease in either *Gladiolus* or *Ixia*. The organism from *Gladiolus* he named *Pseudomonas Gladioli* and the one common to both *Bacillus Ixiae*.

The above organisms are capable of producing " soft rot " of the bulbs and leaf sheaths. They are confined to the intercellular spaces of the parenchyma, where, by dissolving the median lamellae they produce a complete separation of the cells. They do not alter the cellulose walls or the starch grains, but the protoplasm is soon poisoned. *Bacillus Ixiae* appears to attack the pectic matter of the median lamellae more vigorously, whilst *Pseudomonas Gladioli* exerts a greater toxicity towards the protoplasm.

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(2) See also No 316, *B.* Jan. 1911, and No. 616, *B.* Feb. 1911. (*Ed.*).

The writer also found that both organisms can produce the disease in other plants, but that the power of adaptation is less with *Bacillus Ixiae.*

Infection, under natural conditions, probably takes place through the base of the bulbs, where the micro-organisms can readily gain entrance. The conditions necessary for the progress of the disease are a temperature of 25° to 30°C. and great humidity.

As preventive measures the winter recommends: *a*) using only bulbs from uninfected districts and storing them in a dry airy place; *b*) disinfection of the bulbs by plunging for 15 minutes in warm water at a temperature of 50° to 55°C. (122° to 130°F.); this does not hurt them, while the organisms are killed at 47°C. (117°F.); *c*) mould and pots that have been near infected plants should be discarded and the frame disinfected with formol or milk of lime; *d*) the plants must have a free circulation of fresh air, plenty of light, and not too much moisture.

1215 - **Dik-voet, Club-root, or Finger-and-toe *(Plasmodiophora Brassicae,* Woronin*)* in South Africa.** — POLE EVANS, I. B. in *The Agricultural Journal of the Union of South Africa,* Vol. VI, No. 1, pp. 93-97, plates V-VII. Pretoria, July 1913.

This is the first report of the occurrence of this disease in South Africa, though it has undoubtedly existed durng the past 10 or 15 years. The extent of the present outbreak in the Cape Province emphasises the importance of greater vigilance on the part of the farmers and of a more ready co-operation between the cultivator and scientific expert in the control of plant diseases.

Up to the present it has not been observed as occurring on turnips in South Africa, though this is the crop most frequently attacked in England. This particular outbreak appears to be nearly confined to cabbages and cauliflowers.

The writer describes the characters of the disease and the usual preventive measures.

1216 - **"Ferrugem da pimenteira" *(Puccinia Capsici* n. sp.) on Various Species of Capsicum in the State of Sao Paulo, Brazil.** — AVERNA-SACCA, ROSARIO. — Ferrugem da pimenteira, Puccinia Capsici n. esp. — *O Fazendeiro,* Year VI, No. VII, pp. 258-259, 2 figs. S. Paulo, July 1913.

Puccinia Capsici n. sp., which appeared for the first time in 1909, is now a serious pest of capsicums in various parts of the State of Sao Paulo on all types of soil; plants in damp and shady situations are, however, most susceptible to the disease. Up to the present it has been recorded on *C. odoriferum* (pimenta da China), *C. frutescens* (pimenta cumarim), *C. pendulum* (pimenta malagueta), and *C. microcarpum* (pimenta cumarim miuda), but not yet on *C. grossum* (pimentões); it is probable, however, that the latter is equally susceptible, because hardier and consequently more resistant varieties like those above mentioned are not immune to the disease.

This fungus attacks all parts of the plant; on the stalks and branches of several years' growth it produces fruiting pustules, resulting in lesions and hypertrophy of the parts affected. The terminal buds are attacked most severely and become deformed and shrivelled. The leaves become covered with distinct spots, corresponding to fruiting bodies on the under side; they soon curl up and eventually wither. The flowers are also attacked, particularly on the peduncle and calyx; attacks on the peduncles occasion loss of fruit.

1217 - **A Die-back Disease of Douglas Fir produced by a Variety of *Sphaeropsis Ellisii.*** — PETRI, L. in *Annales Mycologici*, Vol. XI, No. 3, pp. 278-230, figs. 1-3. Berlin, 1913.

In the spring of 1912, a large number of Douglas firs, which had been planted 5 to 7 years ago in fresh sandy soil protected by a covert of Scots pine at Grezzano nel Mugello (Tuscany), at 1000 ft. above sea-level, showed a drying up of the tips of the branches. This drying up of the branches ended abruptly a short distance from the summit of the tree and at the point of separation between the dead twigs and the part still green a mycelium could be detected, which spread into the cortical tissues. When kept in a moist chamber, pycnidia developed and the fungus was identified as a variety of *Sphaeropsis Ellisii* Sacc., a species of fungus having many distinct forms identified by the host plant rather than by morphological characters.

The variety on *Pseudotsuga* differs slightly from the known varieties of *Sph. Ellisii* in the dimensions of its spores, and approaches nearest to the variety *Abietis.*

The writer has not yet obtained the germination of the spores in nutritive media.

The chief cause of the outbreak appears to be attributable to the position of the trees attacked; in spite of the south aspect, they have not sufficient light, and grow in an excessively moist atmosphere. At a distance of 50 yards, on the same soil, there are thousands of Douglas firs of the same age, but not shadowed by any other trees, and all are perfectly healthy.

Although direct observation has not yet been made, it is possible that the infection of the Douglas firs took place with spores of *Sphaeropsis* from the branches and cones of the *Pinus sylvestris*, and that the fungus developed on the young trees owing to the special conditions of humidity and temperature.

Successful experiments to prevent infection have been carried out by spraying with a 1 per cent. mixture of lime and copper sulphate.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

1218 - ***Avena fatua* and other Species of *Avena*, with their Hybrids, as Weeds of Cereal Crops in France in 1913.** — RABATÉ, E. La folle avoine. — *Le Progrès Agricole et Viticole*, Year 33, No. 32, pp. 116-180, figs 1-5. Montpellier, August 10, 1913.

Avena fatua (the wild oat), with other wild annual species of *Avena* (*A. barbata*, *A. strigosa*, *A. sterilis*, *A. Ludoviciana*) and hybrids between these and *A. sativa* (the cultivated oat) — all known in France as "folle avoine" and common weeds of grain crops in the south-west and south of the country — has been very prevalent in the crops this season, after a mild winter and rainy spring.

The losses to farmers have been very considerable. In some fields the grain had to be cut green in early June to prevent the wild oat seeds being shed.

From his own observations on some fifty farms, and from reports received, the writer considers that there are good botanical characters for distinguishing the seeds of *A. sativa* from those of the weed species, but the matter becomes hopeless for certain hybrids which are very close to the cultivated oats.

Severe winters destroy the weed species in large quantities.

The deep ploughings of 1912 favoured the great invasion of 1913. After such deep work it is well to take either a spring root crop or a market-garden crop before cereals, as such a crop allows the wild oats to come up in abundance, and they soon get destroyed by the repeated hoeings.

Ploughing the stubble after a very foul crop of wheat only induces the germination of quite a few seeds of wild oats; the majority remain dormant in the soil for many years. Summer ploughing on over-dry land favours the development of wild oats in the grain crop following. On badly infested land oats, wheat and red clover ("trèfle violet de Hollande") must not be grown for several years; on such land smothering crops, such as rye, lucerne, temporary leys, rape and mustard, should alternate with well tilled root crops and green crops cut before the wild oats flower. On such land wheat cannot do better than after two cleaning crops in succession, either a green crop and a root crop, or two root crops.

Commercial oats containing grains of hybrids of weed species with *A. sativa* should be crushed before feeding to stock.

For control measures the writer advises: hand-hoeing in February or March; horse-hoeing of cereals in drills in February, followed by spraying with 10 per cent. sulphuric acid; pulling up of tufts in April and May; pulling of the ears in early June; cutting green followed by ploughing; destruction of chaff which may contain wild oats; and lastly firing the stubble.

INSECT PESTS.

MEANS OF PREVENTION AND CONTROL

1219 - ***Leucopis nigricornis*, a Natural Enemy of *Pulvinaria camelicola*.** — MALENOTTI, ETTORE. Sopra un nemico naturale della "Pulvinaria camelicola" Sign. — "*Redia*", Vol. IX, Part I, pp. 113-155. Florence, August 28, 1913.

Some specimens of *Pulvinaria camelicola* collected at Ascoli Piceno (Italy) on the leaves of orange trees and forwarded to the Royal Station of Agricultural Entomology at Florence, were found to have deformed ovisacs, and the writer discovered this to be due to the presence of dipterous larvae feeding on the eggs. The writer reared these parasites early in June and identified the fly as being *Leucopis nigricornis*, a species already recorded as a parasite of insects in Hawaii and the United States, but which is not very common and of whose habits little is known. It appeared that, in Italy at least, *Leucopis* had not before been recorded as a parasite of *Pulvinaria camelicola.*

INSECTS INJURIOUS TO VARIOUS CROPS

1220 – ***Aelia acuminata*, a Hemipterous Pest of Cereals in Algeria.** — VERMEIL, P. Un ennemi de plus des céréales. — *Revue Agricole et Viticole de l'Afrique du Nord (Algérie-Tunisie-Maroc)*, Vol. II, No. 71, pp. 644-646. Algiers, July 19, 1913.

During May and June, the grain crops (wheat and barley) in several districts of Algeria were reported to be attacked by an insect which pierced the soft unripe grains and caused them to dry and shrivel up in the ear. The writer identified the insect as *Aelia acuminata* (Hemiptera), which occurs normally on uncultivated land, but which in certain seasons multiplies very rapidly and seeks food in neighbouring cornfields.

The writer recommends sowing the corn in separate strips so that a workman can pass between and collect the insects in a butterfly net. In this way many insect pests can be collected and destroyed by burning. Two gatherings at intervals of 8 or 10 days are generally sufficient to remove the bulk of the insects. The cost of collecting and burning the insects amounts to only about 4*d* an acre.

1221 – ***Heterodera radicicola* on the Roots of *Scirpus sylvaticus*, in Silesia.** — OBERSTEIN, O. Eine neue Älchengalle an den Wurzeln der Waldsimse (Scirpus silvaticus L.). — *Zeitschrift für Pflanzenkrankheiten*, Vol. XXIII, Part 5, pp. 262-264, figs. 1-2. Stuttgart, August 20, 1913.

In the spring of this year, Dr. A. Lingelsheim found nodular and fusiform swellings on the roots (chiefly the lateral ones) of *Scirpus sylvaticus* growing in the Botanical Gardens at Breslau. It was found that these swellings were due to the presence of *Heterodera radicicola* Greeff. This discovery is interesting because gall-like formations have not before been recorded on the genus *Scirpus*, and also because *S. sylvaticus* is a new plant host of this widely spread nematode.

1222 – **The Hop Aphis in the Pacific Region.** — PARKER, W^m^ B. — *United States Department of Agriculture, Bureau of Entomology, Bulletin* No 111, pp. 43 + figs. + 10 plates. Washington, May 1913.

The hop aphis (*Phorodon humuli*), known as a pest in Europe long before hop growing became an industry in America, is now a troublesome pest in most of the hop-growing sections of British Columbia, Washington, Oregon and California.

The writer gives the results of his observations and experiments made at Sacramento and Santa Rosa (California). From a series of observations on the biology of the insect and its relations to its host-plants (hop, plum, cherry, peach, apple), he describes the life history as follows.

Two generations are produced on the hibernating host plant, the second of which is winged; five or six generations occur on the hop; some of the fifth generation are winged and give rise to the hibernating generation, whilst others remain wingless and give rise to a sixth generation of winged

Experiment	Materials used	Pressure lbs.	Percentage killed.	Cost per 100 gals.
1	Nicotine sulphate 1 in 3 000	80–100	99.9	$0.416
2	Nicotine sulphate 1 in 3 000; with whale-oil soap, 4 in 100	80–100	99,2	0.80
3	Nicotine sulphate 1 in 3 000; with cresol soap, 1 in 300	80–100	95	0.83
4	Tobacco waste, 25 lbs. to 100 gallons water	100	100	0.18
5	Quassia 9 lbs., whale-oil soap 6 lb., water 100 gallons.	—	—	0.74

males on the hop; these winged males of the sixth generation follow the winged females of the fifth generation, which produce eggs and give rise to the first generation the following spring. The eggs are laid on leaf buds or leaf scars.

The aphides live chiefly on the under side of the leaves and are only to be found on the upper surface during a bad attack; later they migrate to the hop cones. The spread of the attack is facilitated by ants (*Formica subsericea* Say), which cultivate them for the honey-dew and carry them to the young shoots for fresh feeding grounds.

Damage to the hop plants is brought about in two ways: 1) by sucking the juices of the plant, and 2) by the growth of a black smut (*Cladosporium* sp.) in the sugary secretion, which deteriorates the value of the harvest, often rendering it worthless.

Amongst the natural enemies of the hop aphis are the following: *Hippodamia convergens* Guér., *Coccinella californica* Mannh., *C. abdominalis* Say, *Chilocorus orbus* Cas., *Chrysopa californica* Coq., *Syrphus opinator* O. S., *S. americanus* Wied., *Triphleps insidiosus* Say, *Adalia bipunctata* L., *Stethorus punctum* Lec., *Camptobrochis nebulosus* Uhl., *Anthocoris* sp. In spite of these enemies the spread of hop aphis has never been adequately checked and contact sprays are generally adopted, especially decoctions of tobacco or quassia and whale-oil soap.

Spraying should take place in the springtime as soon as the aphides appear on the plum or other fruit tree, then again in the autumn to reduce the attack on the hops. Twice to four times is necessary in the autumn to keep down the numbers of the aphides, and each time the greatest care must be taken to reach both sides of the leaves. Very careful spraying alone has been known to save the crop from serious attacks.

Details are given of several experiments made with different insecticides and of the technique of spraying. Flour paste is specially recommended in place of soap as being cheaper and quite inoffensive. It is made by mixing a cheap flour with cold water until a smooth thin butter is obtained. This is diluted until it contains 1lb. of flour to each gallon of water and is then cooked to a paste, sufficient water being added to make up for evaporation; when mixed with the insecticide the flour paste has a tendency to settle, so that constant agitation is necessary.

The table on the preceding page gives the most important mixtures for use with a compressed air sprayer.

From 300 to 500 gallons per acre are required and one machine will spray from 2 to 3 acres per day. The total cost of spraying 500 gals. per day of the nicotine sulphate flour-paste mixture amounts to $6.79 per acre, whilst the quassia and whale-oil soap mixture amounts to $7.25 per acre. Stripping the vines before spraying will cost from $1.80 to $2 per acre.

A bibliography of 34 works is appended.

1223 - ***Aphrophora spumaria* on Roses and Pinks.** — MOLINAS, E. *L'Aphrophora spumaria* sur les œillets d'Antibes. — *Journal d'Agriculture pratique*, 1913, Vol. II, No 31, p. 155. Paris, July 31, 1913.

Roses and pinks have been attacked this year at Antibes by the larvae of *Aphrophora spumaria* (Hemiptera), which reduced the foliage and caused the young shoots to turn yellow. As a rule the damage due to this insect is slight because the larvae appear only in small numbers and towards the end of the season. The ravages of this pest are kept in check by hand picking and dusting the plants with quick lime.

1224 - **Painted Lady Caterpillars damaging Artichokes in France.** — TSCHAËN, E. Un parasite de l'artichaut. — *Le Progrès Agricole et Viticole (Edition de l'Est-Centre)*, Year 34, No. 29, pp. 88-89, figs. 1-2. Montpellier, July 20, 1913.

The caterpillars of the Painted Lady (*Pyrameis cardui*), which are generally to be found on thistles and mallow in France, occasionally appear in artichoke beds, but its numbers are generally too small for it to be considered as a serious pest.

However, in the spring of 1913, large artichoke beds in the neighbourhood of Hyères were entirely destroyed in a few days by these caterpillars, which then invaded neighbouring plants, including a bed of French beans. Several insecticides were tried, but with little success. The writer suggests that the egg-laying should be carefully watched towards the end of April, and a suitable insecticide used to drive away the butterflies.

1225 - ***Nysius senecionis* Attacking Recently Planted Vines** (1). — PICARD, F. in *Le Progres Agricole et Viticole*, Year 30, No. 30, p. 101. Montpellier, July 27, 1913.

This noxious insect (Hemiptera) is very abundant this year on young grafts in many localities in France. The writer recommends the treatment previously mentioned as being the most effective.

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(1) See No. 1484, *B.* Oct. 1912. (*Ed.*).

1226 - **Some Animal Parasites on *Prunus* in Provence.** — COTTE, J. in *Journal d'Agriculture pratique*, Vol. II, No. 34, pp 243-244. Paris, August 21, 1913

The writer has been studying the animal parasites deforming plants in Provence during the last two years and describes those which he has observed recently on *Prunus domestica* and *P. spinosa.*

Amongst parasites attacking the leaves (already recorded in other European countries) he mentions: a) *Eriophyes similis*, not widely spread and causing little damage; treatment consists of severe pruning and removal of the leaves attacked later by the parasite: it is also kept in check by numerous enemies. b) *Aphis cerasi*, the commonest aphis on plums in Provence. c) *Myzus pruni-mahaleb*, occurs everywhere. d) *Hyalopterus pruni.* e) *Perrisia tortrix*, not frequent.

As a parasite on buds the writer cites another Cecidomyiid, *Asphondylia prunorum*, which, though long known, has been little studied. It rarely occurs on plums, but is common on blackthorn, and the writer recommends the destruction of all blackthorn bushes infested with this pest in the neighboorhod of plum orchards, or at any rate their treatment with a suitable insecticide.

1227 - ***Melitomma insulare* and *Rhina nigra*, Beetles Injurious to Coconuts in Madagascar.** — VUILLET, A. Deux ennemis du Cocotier de la région Malgache. — *L'Agronomie Coloniale*, Year 1, No. 2. pp. 33-37, 1 plate. Paris, August 31, 1913.

The writer describes the life history of *Melitomma insulare* Fairm., its habits and means of combatting it. (1). It occurs in the Seychelles and in the island of Berafia (north-west of Madagascar), where it causes serious damage to coconut plantations; it is probably distributed throughout the Madagascar region.

Rhina nigra Drury also occurs in Madagascar, as well as Berafia, where it has given much trouble. This beetle has been observed to attack trees regularly at a height of 5 feet, though they were already damaged at their base by *Melitomma* beetles. These observations do not agree with those of F. W. Urich concerning *Rhina barbirostris* (2). The eggs are laid in a small cavity of the bark made by the female and the larvae very soon penetrate into the hardest portions of the wood where they bore numerous galleries.

Preventive measures are adopted against this parasite by covering all wounds in the bark with coal-tar, and using a mixture of thick lime wash and lead arsenate (1 lb. of lead arsenate in 10 gals. lime wash) to destroy the eggs laid on the tree trunks. At Berafia the eggs are destroyed by scraping the bark and the application of coal-tar. Trapping the insects by placing sections of decaying stumps in the plantations to attract the fertile females, and destruction of the larvae by boiling water, might be tried with advantage.

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(1) See No. 2005, *B.* June 1911. (*Ed.*).

(2) See No. 1698, *B.* Dec. 1912.

1228 – Insect Injourious to Papaw Apples: *Dichocrocis punctiferalis*. — JARVIS., E. in *The Queensland Agricultural Journal*, Vol. XXXI, Part I, pp. 33-35. Brisbane, July 1913.

A disease of papaya trees was reported from Cleveland in May, and was found to be due to a well-known insect pest, *Dichocrocis punctiferalis*. Though primarily a maize pest, this insect appears to be extending its ravages to fruit trees, reports having already been received of its damaging custard apples, oranges, peaches, loquats, cotton and other fruits and seeds. The infested trees had their top leaves drooping or dead, their main stems defoliated, with small discoloured fruits hanging from the blackened crowns.

The full-grown moth measures about an inch across the expanded wings, which are pale orange-yellow with numerous dots. It appears only at night and lays its eggs on the base of the leaf stalk or occasionally on the fruits. The larvae penetrate the stalk and bore their way to the crown, where they pupate. A full-grown larva is nearly an inch long, dirty white in colour, and marked with rows of grey spots. Its head is dark brown and the first segment of a lighter brown colour. It pupates in a loose silken web on the exterior of the crown of the tree.

The following preventive measures are recommended: 1) Spraying with arsenate of lead (1 lb. to 50 gallons of water) in the form of a mist-like spray. This is directed principally against early broods and should be applied early. All trees, profitable or unprofitable, that are liable to be attacked in the neighbourhood should be sprayed. 2) Maize grown as a trap-crop and destroyed immediately the grubs are approaching full size. 3) Destruction of all infested fruit, such as peaches, etc. 4) Avoid planting maize, except as a trap-crop, near orchards.

1129 – Deformation of the Flowers of *Fraxinus Ornus* caused by *Eriophyes fraxini*. — SIRENA, CORLEO SIMONE. Alcune deformazioni del *Fraxinus Ornus* — *Malpighia*, Year XXX, Part V-VI, pp 512-517. Catania, 1913.

The author has observed certain peculiar gall-like formations on the flowering branches of *Fraxinus Ornus* growing near Palermo. These growths appear here and there on long or more frequently short stalks as irregular shaped masses, somewhat flattened and lobed, of a reddish-brown colour, turgid and more or less glandular. According to the writer they represent floral axes, the numerous protuberances of which are small groups of deformed and aborted flowers surrounded by the rudimentary floral organs. In some of them a small circular depression is noticeable in the centre, corresponding, perhaps, to the receptacle, but no trace of the pistil is discernible.

These malformations are caused by an acarine pest, *Eriophyes fraxini*, more commonly known as a parasite of the common ash (*F. excelsior*).

The writer has observed that these aborted floral receptacles secrete a sugary liquid which is devoured by ants. This is remarkable, since the flowers of *F. Ornus* do not normally secrete nectar; it may be accounted for by the great quantity of sugar occurring in the sap, especially in summer. Owing to the excessive turgesence of the swellings produced by the insect this sweetish secretion is exuded. It seems to be the first record of secretions from acarid galls.

ALFREDO RUGGERI, *gerente responsabile*.

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Agricultural Meteorological Service in Germany

by

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The present meteorological service in Germany was instituted in 1906, but previously several State and private institutions had done similar work. Thus the German Sea Observatory (Deutsche Seewarte) founded in 1876 in Hamburg had begun to issue weather forecasts for Germany, besides attending to meteorological observations along the coast and to storm warnings. But after only a few years (1884) the weather forecasts were discontinued. Then State Institutions undertook the publication of weather forecasts for the inhabitants of the country, namely in the Kingdom of Saxony in 1878, in Bavaria and in Württemberg in 1881, in Baden in 1882 and in Alsace-Lorraine, besides which there were private observatories in Berlin, Magdeburg and elsewhere which had been started in accordance with the wishes of the press. Plenty of experience collected both at home and abroad was thus available when the present service was organized.

The object aimed at was that the State service should in the first place spread rapidly and cheaply the results of the observations made, leaving the receivers of such information, especially farmers, the task of drawing the necessary conclusions from them and forecasting for their own locality the probable weather. By this means it is possible to utilize for weather forecasts the great and valuable experience which practical farmers possess, besides which the farmers are left more time to prepare their forecasts than the directors of the meteorological stations can dispose of, at the latter must telegraph their forecasts as early as 11 a. m., while the farmers can continue for a few hours longer to observe the weather before considering the approaching changes.

The complete execution of this plan would entail the total abolition of official forecasts and the limitation of the service to the simple dstribution of the weather charts. But in order to render this feasible the great mass of farmers ought to possess the necessary knowledge for the comprehension of the weather charts, without which all weather forecasting is impossible. As for the moment such knowledge cannot be reckoned upon, the weather bureau has undertaken the publication of daily forecasts, and at the same time the general spread of that knowledge which with time will render the forecast unnecessary.

The *Hamburg Marine Observatory* is the Central Office; it is at the same time one of the Service Offices (Dienstelle) of which more will be said below. It receives several times in the course of the day ciphered telegrams conveying the results of observations made at numerous home and foreign stations, with the help of which it draws up the telegrams for the home service; these, under the name of *Deutsche Abonnements-Wettertelegramme* (German subscription weather telegram), can be obtained at reduced prices from all the German telegraph stations. These cipher telegrams are of three kinds:

1. The first *Wetter-Abonnement Telegramm* according to the formula *BBBWW SHTTA RB'B'VN,* contains the morning observations of 58 stations; it leaves Hamburg at 9.15 a. m., and costs 20 Marks (about £1) per month.

2. The *Abonnement Extra Telegramm,* according to the same formula, gives the morning observations of 21 other stations. It leaves Hamburg at 9.45 a. m. and costs 10 Marks (about 10 s) monthly.

3. The *Abonnement Nachmittags Telegramm* according to the formula *BBB WW SHTTV'.* It contains the afternoon observations (2 p. m.) of 30 stations, and leaves Hambourg at 4 pm and costs 10 Marks monthly.

In the above, *BBB* signifies the three figures of the barometer reading, omitting the first 7 and the decimal point, thus giving the tens, units and tenths of millimeters, of course reduced to 0° C. and sea-level. The fourth and fifth figures, *WW*, indicate the direction of the wind, the figures from 00 to 32 being supposed to be disposed in a circle like the points of the compass, so that 32 represents the north, 08 east, 16 the south and 24 west. Consequently 04 signifies north-east, 06 east-north-east, and so on.

The sixth figure, *S*, stands for the force of the wind according to Beaufort's scale. When this is above 9, the figure 9 is used and the force of wind given in words at the end of the telegram.

The seventh figure, *H*, gives the state of the sky, namely 0 cloudless, 1 fine, 2 half overcast, 3 cloudy, 4 overcast, 5 rain, 6 snow, 7 mist, 8 fog., 9 thunder storm.

The following two figures, *TT*, indicate the temperature of the air in round numbers, the decimal 0.5 being rounded upwards. Only in the neighbourhood of zero the following notation is adopted:

— 0.5°	95	+ 0.1°	41
— 0.1°	91	+ 0.2°	42
0 0°	00	+ 0.5°	45

Further, *A* indicates the trend of the barometer, that is the change in pressure during the three hours from 5 to 8 a.m. rounded up to whole millimeters. The minus sign before *A* when the atmospherec pressure is falling is indicated by an increase of 50 in the figures *WW* representing the direction of the wind.

R shows the amount of rainfall during the last 24 hours according to the following scale: 0 = 0 millimeter, 1 = 0.1 to 0.4 mm., 2 = 0.5 to 2.4 mm., 3 = 2.5 to 6.4 mm., 4 = 6.5 to 12.4 mm., 5 = 12.5 to 20.4 mm., 6 = 20.5 to 31.4 mm., 7 = 31.5 to 44.4 mm., 8 = 44.5 to 59.4 mm., 9 = not reported.

B'B' indicates the barometric pressure of the preceding evening; the first 7 is omitted and the reading is rounded up to whole millimeters.

V signifies, at the German stations, the state of the weather during the last 24 hours, namely: 0 fine weather prevailing, 1 fairly fine (cirrus clouds), 2 cloudy (low clouds), 3 lightning (more than one flash), 4 morning rainfall, 5 afternoon rainfall, 6 night rainfall, 7 thunderstorm (at least one thunder-clap and one flash of lightning or several thunder-claps without lightning; requires always some short addition of words), 8 rainfall in showers, squalls, changeable, occasionally clearing up, some sunshine, 9 continuous rain during a great part of the day or general rain with mostly overcast sky. Between 0 and 3, at most 0.4 mm. of rainfall is assumed and the afternoon cloudiness is especially important; from 4 to 6 more than 0.4 mm. of rainfall is assumed but no thunderstorm, or at most one thunder-clap without lightning. In foreign stations the cipher *D* is used to complete the data of some German stations. *N* is the first number of the successive numbers according to which the stations follow each other in the telegram. Lastly *V'* (in the afternoon telegram) signifies the kind of weather it has been between the morning and afternoon observations, namely: 0 mostly fair, 1 tolerably fair, 2 mostly clouded, 3 lightning (0 to 3 dry), 4 slight rainfall, 5 heavier rain, alone or with snow or sleet, 6 heavier fall of snow (alone or with some rain or sleet), 7 thunderstorm, 8 rainfall in showers, 9 continuous rain.

The whole country is divided into *meteorological service districts* in each of which a station (*Dienst stelle*) is situated, besides which some districts possess sub-stations (*Nebenstellen*). At present the stations and sub-stations (in brackets) in Germany are the following: Hamburg, (Flensburg, Oldenburg), Berlin, Königsberg, Bromberg, Breslau, Magdeburg, Frankfurt a.M., (Giessen, Saarbrücken), Ilmenau, Werlburg, (Cassel, Coblenz), Aix-la-Chapelle, (Bonn, Dortmund, Essen), Dresden, (Planen, Wurzen, which does not issue charts but only forecasts), Münich, Stuttgart, Carlsruhe, Strassburg.

On the annexed map the North German stations and the boundaries of their districts are marked in red, while the limits of the forecast districts and the sub-stations are shown in green.

These stations have the duty of following uninterruptedly the course of the weather and of delivering reports daily, Sundays and holidays not excepted, upon the actual weather and upon what is expected. As a basis for these reports, besides the Hamburg weather telegrams, telegraphic and postcard reports from the district itself are received and used. These are sent regularly and also whenever any meteorological event of special interest occurs (such as cloudbursts, hail or thunderstorms). Besides the above, reports on the water-level of the most important streams of the district and special observations are also sent in.

On the basis of these communications and observations the station has to prepare daily a weather chart and by means of a simple process to make rapidly so many copies of it that the printed chart (which, besides the synoptic graphs of the weather made at 8 a. m. contains some observations made in the district itself, namely water-levels, a review in words on the weather since the preceding day and a forecast for the next day) is ready to be mailed at 11 o'clock in the morning and wherever possible it reaches the subscribers before evening.

This result has not yet been completely attained, though there is no doubt that the value of the weather chart depends only upon its rapid distribution and almost disappears when it is distributed on the following day. There are, however, numerous localities in which the post is delivered only once a day and by a postman who starts from the railway station in the morning before the arrival of the weather chart for that day, which takes place in the afternoon. In such places the chart is already twenty-four hours old when it is distributed, and its value is very much reduced. In order to remove this inconvenience, since the middle of October 1912 at the Hamburg station the experiment is being made of issuing a second weather chart in which the evening observations up to 8 p. m. are given, and which is ready for the post by 9 p.m. As this is but little over 12 hours old when it is distributed, it can be very useful in all those places in which the morning chart does not arrive in time. The general introduction of this evening chart together with the morning chart would be very desiderable, but considering its cost it has not yet passed the experimental stage.

The price of the weather charts is kept as low as possible; it is generally 0.50 Mark (about 6 *d*) per month, of which 0.14 Mark (about 1 $^{3}/_{4}$ *d*) is postage expenses; in the Strassburg district it is 0.60 Mark (about 7 ¼ *d*) and in Bavaria inclusive of postage 1 Mark (about 1 *s*). In the Weilburg district the price for schools has been reduced - for an experiment - to 0.40 Mark (less than 5 *d*) including postage, when all the schools of a school district subscribe for a whole year. The total number of weather charts daily distributed in Germany amounted in the summer of 1912 to about 13000; in winter the number was smaller. In many places such as schools, post offices and the like they are hung up to the public, and mostly those for three consecutive days. Besides this the weather charts are daily reprinted by many newspapers.

The Station has further to prepare daily the weather forecast which covers from midnight to midnight and to supply it in a sufficient number of copies (for the various lines) by 11 a. m. to the nearest telegraph station. As, however, the districts of the Stations are too extensive for one weather forecast, they have been divided according to their climatic conditions (and partly also according to their telegraph lines) into forecast districts (shown in green on the annexed map) and the stations are authorized to send different forecats for these sub-districts. After some unsuccessful experiments in shortening the forecast by using code words, this is at present transmitted in plain language; not more than eight words are allowed, the average number being five. During the summer service (May to September inclusive) this forecast is hung up shortly before noon in all German telegraph offices and its communication by telephone may be had from the telegraph offices on payment of 0.10 Mark (about 1 ¼ *d*).

The subscription for regular communication of the forecast costs: by telephone or ordinary post 2 Marks (about 2 *s*) per month; quarterly 4.50 M.; half-yearly 8 M.; by country postman 3, 6.75 and 12 M. respectively; by express messenger (besides cost of rural messenger) 4, 9 and 16 M. In winter the forecasts are only hung up where a special subscription is paid (2.50 Marks per month). This happens in some towns at the request of the civic authorities. It is hoped in future to extend the summer service to November 1, as would be desirable in the interests of the vine and fruit-growing industries.

The *Sub-stations* like the Stations receive, the information necessary for the preparation of the weather charts and besides this they get from the Stations partly by telegraph and partly by telephone the general review of the weather to be published on the chart and the forecast. Usually before drawing up the forecast a short telephonic conversation takes place between the Station and the Sub-stations during which observations and considerations are exchanged. The final drawing up of the forecast is expressely entrusted to the Stations.

In order to keep the whole Meteorological Service in close touch with practical agriculture, in most districts reliable collaborators (*Vertrauensmänner*) have been appointed. These are practical farmers, teachers of agriculture and the like, at least one in each district, who constantly devote their attention to the Meteorological Service; they express their opinion on the weather forecast and follow all the details of the work. Their criticism of the forecast is expressed in figures and sent every week on post-cards to the heads of the Service. The value of these "percentages of hits" is not very great, as the judgment cannot be kept perfectly free from individual valuation, and besides the economical significance of correct forecasting varies very much; thus, at a change of weather a correct forecast is much more valuable than during a long period of the same weather. For these reasons the "percentage of hits" and the comparison of those of different districts are not published; nevertheless, they often give the directors of the Service useful hints and have thus, in spite of many objections, been kept up. Further, the Vertrauensmänner transmit to the directors many of the wishes and proposals arising from the daily practice of farming, and in this manner many valuable improvementes have been made in the meteorological service.

As has already been said, the most important duty of the meteorological service consists in the timely sending off of the daily weather charts, that is the spread of the observations of facts that have really happened, while the official forecasting is destined to become gradually less indispensable. Of course this aim cannot be reached until the great majority of the people, and especially of the farning classes, are in a position to understand the weather charts and to consider their own local weather in connection with the state of the weather in the whole of Europe. It has thus been made an especial duty of the directors of the Service to spread knowledge on the objects aimed at and methods followed by the Meteorological Service, as well as on the limits of its capabilities.

Lectures and discussions in meetings of associations, especially agricultural and educational, as well as special courses for teachers and the inclusion of meteorology in the curriculum of seminaries and universities, provide both for making grown-up people acquainted with the principles of meteorology and for introducing this branch of science into the schools.

Moor Cultivation in Austria

by

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Methodical and systematic efforts to encourage the cultivation of moorland were begun much earlier in Germany and Sweden than in Austria. The Moor Experiment Station at Bremen was founded in 1879, and to the work of this institution we are indebted for laying the foundations of our knowledge of the formation, structure and efficient treatment of peat soils, and in particular for the modern method of cultivation, which has taken the place of firing the moors. The Experiment Station of the Swedish Moor Cultivation Society at Jönköping began its activities in 1887 ; as Sweden also contains vast stretches of moorland, its area of work is as large as that of the Bremen Station. The area of moors in Germany is stated to be about 7 000 square miles.

The situation in Austria is very different : whilst in Germany moors frequently form enormous uninterrupted tracts of waste, largely State property, Austria possesses a large number of moors of small extent, almost all of which either belong to private persons, particularly needy small-holders, or are common-land. Under these circumstances, the far-reaching schemes of colonisation on a large scale, which at present form the main feature of the State-aided endeavours towards moor-cultivation in Prussia, are out of the question in Austria ; here the problem is to establish numerous profitable small holdings and to put many thousands of acres of moorland to the most suitable use, a use which is also of the greatest importance for the development of our stock farming, *viz.* the growing of fodder crops, for which no soil is anything like as well suited as properly cultivated moorland.

The model for Austria was provided by numerous instances of highly successful starting of moor cultivation in Germany and Sweden. It was soon found that, with slight and generally unessential alterations, all that had been learnt elsewhere could be applied in our country. These alterations are occasioned not by any difference in the characters of our moors, but chiefly by climatic influences. Moor belongs to the type of soil which offers the greatest obstacle to the passage of water, surpassing even clay in this respect. As many of our moors, especially those in the Alps, occur in very rainy districts, particular attention must be paid to the proper regulation of the ground-water. It is obvious that the draining of a moor, which is a primary condition for its reclamation, cannot be carried out in regions with a rainfall of 1200 to 2000 mm. (48 to 80 in.) in the same manner as in North-West Germany and Galicia where the precipitations amount to only between 500 and 700 mm. (20 to 28 in.).

Our moors show no essential differences in chemical composition and botanical origin from those of other lands, as has been shown by the numerous investigations of the Moor Cultivation and Peat-Utilization Section (" Abteilung für Moorkultur and Torfverwertung ") of the Vienna Station, founded in 1901. It is true that many of the Austrian moors on the Primary rocks show a somewhat higher potash-content, but the total amount is small and it occurs in a form soluble with extreme difficulty, so that — as with phosphoric acid — potash in the form of an artificial manure must be applied. As regards nitrogen-content also, our moors are in agreement with those of other countries. The true moors are generally very poor in this nutrient material and consequently always require nitrogen-manuring, while the fens are generally much richer and contain the nitrogen in a more readily soluble form, so that they can frequently do without any addition of nitrogen. There are, however, exceptions : many fens, especially before the peat is much decomposed, dispose of such small quantities of assimilable nitrogen that their full cropping capacity cannot be reached; such fens, at any rate in the first few years of cultivation, respond well to nitrogenous dressings.

The climate, and in particular the heavy rainfall, also leads to a modification in the application of the manure. While basic slag and potash are normally applied in the autumn in districts with low rainfall, spring dressings have proved more suitable at the Admont farm of the Vienna Experiment Station. In the first place it has been found that the action of the manures is just as quick when they are not applied till the spring and secondly it is obvious that in this way the unavoidable loss of plant-food owing to the considerable leaching of the soil is reduced. The knowledge of this fact is a great relief to the moor-farmer of the Alpine region ; for he can wait quietly for the warm season to set in, with the certainty that thoroughly good results will be obtained if he applies his manures at the end of April, or even if necessary not till early May. Manuring and seeding frequently take place on the same day, and this produces no bad effects when the preparation for roots and grain crops does not take place till the end of April, and grass-seeds are sown in May. Peat is a bad conductor of heat, and a considerable time must elapse before the soil gets sufficiently warm for the seeds to begin to germinate. Late sowing avoids the disadvantage of having the seed lying too long in the wet and cold ground, and gives a much more regular germination; the relatively considerable warmth which very soon sets in in the Alps induces much quicker growth, so that the difference between early and late sown crops disappears in a few weeks.

Spells of bad weather are frequent in the spring in the Alps, and the snow melts gradually, so that the soil remains sodden and cold; for this reason thorough spring cultivation cannot be managed without long delays disadvantageous to the farmer, and autumn ploughing becomes an absolute necessity. Moor soil must as far as possible be got ready to receive the seed in the autumn, so that only harrowing is required in spring. Besides its generally recognized advantages, autumn ploughing is specially valuable for moor cultivation, as it gives full opportunity for the frost to exert its loosening and opening action on the insufficiently decomposed peat. In this way the teams are spared a great deal of work and the soil soon takes on a fine tilth, so that the main condition necessary for thriving crops is fulfilled. Only on thoroughly tilled soil, sufficiently decomposed and loosened, will drains run evenly, and the same conditions are necessary for even germination of seeds and regular development of the young plants. The importance of this in growing fodder crops—the most valuable form of utilization of moorland — is obvious. Only with thorough tillage and a finely decomposed surface is it possible to get an even closed grass-covering; but when this is obtained, the meadow gives yields generally far exceeding those of the best artificial grassland on mineral soils and has the particularly valuable property of keeping up its production even during long periods of drought, thanks to the well-regulated supply of moisture on properly drained moorland.

Owing to the heavy and generally regular rainfall in the Alps, the first operation for the reclamation of a moor is drainage, and this must be carried out with the greatest care. At the same time, the conditions are more favourable here than in less rainy districts, in that the consequences of excessive draining are generally not so much to be feared, since the rains and heavy dews always provide sufficient moisture for the soil. Excessive draining should, however, be avoided, as it is ultimately detrimental and is inseparable from heavy expenses, which unnecessarily burden the improvement accounts. Drainage should therefore be restricted according to local requirements; in particular, where artificial meadows and pastures are to be formed excessive drainage should be guarded against; in general the leading principle holds good that moor soils should be more thoroughly drained for arable crops than for artificial meadows, and pasture also requires more drainage than meadow to prevent poaching by the cattle grazing it.

The important question whether open drains or tile drains are to be preferred for moorland has been settled in principle in favour of the latter. In these rainy regions, where the drains must be close together, the laying out of a system with only open drains would mean such a cutting up of the land that the advantage of tile drains is clearly evident on purely practical grounds. Open drains also need continual inspection, and keeping them in proper condition involves expenses which are not required for tile drains; the cost of making bridges and the loss of cultivable surface are also to be set against open drains. Further, with open drains pastures can only be arranged by the use of special devices (fences, etc.) for the protection of the ditches from the cattle. Lastly tile drains generally give a more efficient drainage than open ones. As soon as frost sets in on the moor soil, and of course also in the open drains, layers of ice form on the sides and bottoms and stop the running of the drain; in spring no water can run off till these ice layers are melted, which is often quite late after severe winters, owing to the low heat-conducting power of peat. Tile drains, if laid deep enough, carry off the ground-water even in winter, and so allow the soil to warm up from below; consequently tile-drained fields are generally free from snow and dry and ready for working earlier, and for all these reasons are two or three weeks alread of those drained only by open ditches. All these considerations are in favour of the wide-spread adoption of tile drainage; open drains have the one advantage of supplying plenty of material for levelling, which would otherwise have to be obtained by making diggings on purpose. In the rather frequent cases in which levelling of the land to be reclained is necessary, the matter can be dealt with by a combined system of open ditches for the mains and tiles for the minor drains. The collecting ditches into which the minors empty should then be arranged regularly, and if possible parallel to one another; they may be as much as 200 yds. apart, and in this way allow of pastures being laid out, as only the main ditches need fencing to keep the banks from being troddendown by stock.

One of the numerous differences between fens and moors is that the former are mostly rich in lime and decompose quickly after drainage, with its consequent aeration, and regular working, while the moors with their low lime-content only slowly take on the crumb structure. The decomposition of moor-peat is greatly helped by a single dressing of lime as quicklime, marl or carbonate of lime, provided the lime material is thoroughly mixed with the cultivable soil. Under North German conditions a sufficient liming has been shown to be 1800 lbs. of quickline, or its equivalent in marl, for arable land, and 2700 to 3600 lbs. for grassland per acre of moor; heavier dressings generally do damage to the crops. In the Alps and also in Bavaria, whose moors and climate have much in common with those of the Alpine districts, it has been found that though such dressings can be applied without harmful results, the same effect is produced by smaller amounts, about half, always provided the soil is very thoroughly worked. It would take us too far from our subject to discuss the causes of this phenomenon in detail; but it seems to be attributable to the higher summer temperatures, and perhaps also to the severity of the winters, which encourage and hasten the chemical and physical processess leading to the decomposition and reduction to earth of the moor-peat (1).

In North-West Germany good results have been obtained, especially on large areas of true moor, by inoculation with nodule bacteria, which allow of nitrogen-assimilation on the part of Leguminosae; this method was introduced there by Saalfeld. Without such inoculation, which is generally carried out by spreading soil containing the bacteria, the growimg of leguminous crops is not practicable except by addition of sufficient quantities of nitrogenous manure The conditions are different on the moors of our Alpine districts: here the nodules form well without any inoculation, so that artificial introduction of the nodule organisms is superfluous. This is attributable to the small extent of the individual moors in our country; those of over 250 acres are by no means common and belong to the larger estates. As they are mostly surrounded by cultivated mineral soils it is evident that soil inoculation will have no special effects, as it is already carried out regularly by the wind. It succeeds in spreading particles of soil laden with nodule organisms evenly over comparatively small areas, but does not extend its action to the extensive tracts of moor in North-West Germany, so that there soil inoculation will continue to play an important part, at any rate as long as the bulk of this moorland remains unreclaimed.

In spite of the small extent of most of the Austrian moors, particularly those of the Alpine districts, moor cultivation is of great importance for the districts concerned. From the official moor-statistics (2) drawn up by the Moor Section of the Vienna Experiment Station, it appears that the moor property on crown land in Lower and Upper Austria, Salzburg, Styria, Carinthia, Carniola, the Tyrol and the Vorarlberg comprises some 81 500 acres; this does not include the very abundant grass moors (« sauren Wiesen "), which are to be reckoned as moors in course of formation and require similar treatment for reclamation, though they do not supply utilizable peat. The average yield of good artificial meadows on moor soil may, according to all experience, be set down at 56 cwt. of first-class hay per acre; but it frequently reaches much higher figures, especially on fens, even 80 cwt. or more. The reclamation of the Austrian Alpine moors would thus mean a very important increase in the production of first-class fodder, and consequently in the number of cattle kept — and this without considering the increased value of the land. Thus, while moor in its original condition gives practically no yield, it can be permanently improved with normally small expenditure, and the moor soil then forms the best and kindliest cultivated soil we possess.

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(1) For further information, especial on the draining, cultivation, manuring, etc., of moors, see: BERSCH, Handbuch der Moorkultur, 2d. edition. — Vienna, Wilhelm Frick, 1912.

(2) "Nachweis der Moore in Niederösterreich, Oberösterreich, Steiermark, Kärnthen, Krain, Tirol und Mähren „. Prepared by the Imperial and Royal Experiment Station for Agricultural Chemistry of Vienna, by order of the Ministry of Agriculture. Published, under instruction, by Wilhelm Frick 1911

The conditions in Austria are such that the moor-farmer — at any rate in the Alpine districts — can rarely bear the whole expense of the improvements, as he lacks not only the confidence and the practical experience necessary but also the means. The confidence of the farmer is first gained by courses of instruction and lectures, and by the establishment of model moor-meadows ; the plans for the improvement are then drawn up at the expense of the Central or Local Government, and the authority in question provides substantial assistance, generally amounting to 60 per cent. of the total expenses, to the Drainage and Moor Cultivation Cooperative Society (1) ; finally, further support is given in the shape of implements for working the moor soil, artificial manures and grass-seeds. In this way it has been possible in many places to convert almost wholly unproductive moors into first-class artificial meadows, and thus to encourage cattle breeding and at the same time to furnish examples of the advantages of cooperation in this direction.

The cooperative production of peatmoss litter is also encouraged by the Government, by the provision of machines for its preparation. Moors which were formerly left idle, or at most formed pasture of the poorest quality, now enjoy the appreciation which is their due, and this finds expression in the increase of prices of moorland.

Whilst, as far as climate allows, almost any moor can be used as arable land, yet the production of fodder is the most profitable use to which moorland can be put, and this type of farming gives as good results in Austria, and particularly in the Austrian Alps, as elsewhere.

Experimental Results obtained of Recent Years by the Section of Agricultural Chemistry of the Central Agricultural Experiment Station of Stockholm

by

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Chief of the Section.

I. — NITROGENOUS MANURES.

1. *Experiments with new nitrogenous manures or substances proposed as such: cyanamide, nitrate of lime, dicyandiamide, cyandiamidine.* - Both wheat and rye have proved much more sensitive to cyanamide than oats. An addition of 0.75 gram of nitrogen, under the form of cyanamide, per pot containing 26 kg. (57.2 lbs.) of earth, which did not cause the slightest harm to oats, acted so unfavourably upon wheat and rye, — even when applied

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(1) See also: " Moorkultur und Torfverwertung auf genossenschaftlichen Grundlage in Oesterreich,, by Dr. WILHELM BERSCH, in *Jahrbuch der Moorkunde*, Year 1, 1912. Hanover, M. and A. Schaper, 1913.

a week before sowing, — that the majority of the plants died within four weeks. Only after sowing again did the plants develop quite normally.

As for the increased yield in grain, cyanamide gave with wheat 68.2 to 80.2, and with oats 30.8 to 64.1 per cent of the effect of nitrate of soda. For the total yield the corresponding figures for wheat were 61.8 to 68.4 and for rye 44.8 to 66.5 per cent.

With oats the action of cyanamide was much nearer that of nitrate of soda. The observed relative increases of yield were, considering the increase due to nitrate of soda to be = 100, for grain : 98.2 to 99.1, and for the whole crop 91.6 to 93.9.

With cyanamide manuring the nitrogen content of the straw was always greater than with any other form of nitrogen.

Nitrate of lime in its effects on rye and oats stood on a level with nitrate of soda ; on wheat, on the contrary, especially for the yield of grain, it proved decidedly inferior.

Dicyandiamide caused unmistakeable signs of poisoning in oats and their yield was inferior to that of the lot without nitrogen. The application of dicyandiamidine under the forms of sulphate or phosphate also caused the plants to be sickly and to develop very scantily.

2. — *Experiments with sulphate of ammonia.* — The plants experimented upon were oats, barley, wheat, rye, carrots and potatoes. The sulphate of ammonia had throughout very good effects on oats, and especially so when the phosphoric acid was given under the form of bone meal or basic slag. If the action of nitrate of soda be taken as 100, that of sulphate of ammonia ranged from 90.8 to 195.8. The variations in favour of ammonia were thus as a rule much greater than those observed with nitrate of soda. As for barley, a mixture of nitrate of soda and sulphate of ammonia in equivalent quantities gave somewhat better results than nitrate alone. As exclusive source of nitrogen, ammonia gave much worse results. With rye, ammonia was somewhat superior to nitrate, while with wheat the reverse was the case. Carrots and potatoes on the whole profited equally by either nitrogenous manure.

3. *Top dressings with cyanamide alone or in conjunction with nitrate of lime.* — Experiments with oats in which, besides cyanamide, the following manures were applied and their effect as sources of nitrogen compared with each other: nitrate of soda, nitrate of lime, and mixtures of cyanamide and nitrate of lime in the proportions of 1 : 1 ½ (A) and 2 : 1 (B). All of these manures were given in one set of experiments eight days before sowing, and in another as top dressings after the plants had appeared.

a) Nitrogenous manures applied before sowing.

Nitrate of lime proved equal to nitrate of soda. Also the effect of cyanamide was quite good and on the grain yield was even slightly better than nitrate of soda. The mixtures of cyanamide and nitrate of lime gave higher yields than either of the two by itself. Mixture B was the best. Even when double doses of nitrogen were given no ill effects caused by cyanamide were observed.

b) Nitrogenous manures used as top dressings.

The effect of both nitrates, and especially that of soda, is notably increased when they are used as top dressings, on the contrary all the mixtures containing cyanamide proved injurious when given in this way; in some cases the plants experimented upon were enfeebled and in others they were completely destroyed Consequently cyanamide gave lower yields than the lots without nitrogen.

4. *Experiments with so-called basic nitrate of lime and "granulated" cyanamide on oats.* — The effect of the above manures was compared with that of nitrate of soda and of sulphate of ammonia. When the nitrogenous manures were mixed with the soil in single doses, basic nitrate of lime gave the best result, while in double doses sulphate of ammonia was superior. In the first case the differences were so slight that the effects of nitrate of lime may be considered approximately equal to those of nitrate of soda and of sulphate of ammonia. The action of the "granulated" cyanamide was somewhat inferior. As in the preceding experiment, cyanamide as a top dressing caused either the death of the plants or a temporary weakening.

5. *Comparative manuring experiments with nitrate and ammonia on turnips.* — It was found that ammoniacal nitrogen was on the average more favourable than nitric nitrogen. If the increase of fresh roots obtained by nitrate of soda be set equal to 100, the corresponding increase caused by sulphate of ammonia was 145,4. The weights of the dry matter in the crops stood as 100 : 126.7. The results tally with those obtained in previous field experiments.

II. PHOSPHATIC MANURES.

1. *On the after-effects of some phosphates.* — The following series of experiments, which extended over five years, were carried out on pots containing 25 kg. (55 lbs.) of sandy soil, with the object of determining the relative manurial values of superphosphate, precipitated dicalcium phosphate, precipitated tricalcium phosphate and steamed bone flour. The plants employed were oats and barley. The experiments show that the total effect of the manures during the five years is superior in the case of the lighter soluble phosphates. The effect of the dicalcium phosphate was about equal to that of the superphosphate. Both of them were decidedly superior to that of the less soluble phosphates (bone flour and tricalcium phosphate) and this also in those cases in which (as with bone flour) the results during the first year had been equal or nearly equal to those obtained with superphossphate.

The effects of superphosphate and of dicalcium phosphate during the whole five years were not, in the main, influenced by the addition of calcium carbonate, while on the contrary the effects of bone flour and of tricalcium phosphate were much reduced and finally completely obliterated by calcium carbonate. The partial substitution of nitrate of soda by sulphate of ammonia has almost always slightly increased the utilization by the plants of the less soluble phosphates.

The results of the experiments are in opposition to the frequently advocated opinion that the lower direct effect of the less soluble phosphates is compensated by their abundant after-effects.

2. *On the manurial value of some phosphates.* — The following phosphates were experimented upon: *a*) Tunisian phosphates; *b*) precipitated bone phosphate; *c*) electrolytically precipitated dicalcium phosphate (so-called " Palmaer phosphate ") obtained partly by rapid and partly by slow precipitation; *d*) artificial phosphate of iron, Fe PO , and *e*) so-called " Bernard phosphate ", said to be prepared by calcination of low grade crude phosphates. The experiments were carried out with oats in pots containing 26 kg. (about 57 lbs.) of sandy soil.

If the increase of crop due to superphosphate is taken as equal to 100, the effect of Tunisian phosphate was 22.2, while that of precipitated bone phosphate was between 111.2 and 116.6. The slowly precipitated dicalcium phosphate had a somewhat less favourable action than that of the normally obtained one. The increase of yield due to the phosphate of iron was about one-fifth of that due to superphosphate. Lastly the Bernard phosphate showed no effect at all.

3. *Experiments with nitrophosphate* (" *Nitrat phosphat* "). The so-called " Nitrat-phosphat " is produced by the Norwegian Hydro-electric Nitrogen Co. by treating crude phosphates with nitric acid. The manure that was examined contained 30 per cent. lime, 30.5 per cent. phosphoric acid and 3.6 per cent. nitrogen. It was thus in the main a dicalcium phosphate. As experimental plant, oats were used. The manurial value of superphosphate being 100 that of the nitrophosphate was between 100 and 107.9. The action of the phosphoric acid in this manure was thus very nearly the same as that in superphosphate.

III — VARIOUS OTHER EXPERIMENTS.

1. *Manurial value of so-called nitro-ammonia-lime* (" *Nitrammonkalk* "). Exhaustive experiments showed that nitro-ammonia-lime, a manure produced by the action of quicklime on sewage sludge, owes its favourable action chiefly to the lime it contains and only to a very small extent to its insignificant content of real plant foods.

2. *On the manurial effect of common salt.* — The experiments in this connection were carried out with oats, which were grown on a poor sandy soil not specially deficient in potash. Nitrogen was given as nitrate of soda and sulphate or chloride of ammonia, and each of these nitrogeneus manures was given with and without a quantity of common salt (3.1 gram per pot) corresponding in sodium content to the nitrate of soda.

From the investigation it resulted that the addition of common salt caused a considerable increase in the yield in those cases in which nitrogen had been given as nitrate of soda or as sulphate of ammonia, but not under the form of ammonium chloride + sodium chloride. No injury due to manuring with common salt was observed. The results of the experiment justify the conclusion that, at least in the present cases in which more than sufficient quantities of potash and phosphoric acid were already present in the manure, and the water requirements of the plants were met by watering, the increase of yield obtained by the addition of common salt is due to the direct manurial effect of the sodium chloride, and especially of its chlorine content, which further agrees with the fact that the soil on which the experiment was carried out was rather poor in this element.

2. *Experiments with radio-active manures.* — A so-called " radio-active catalytic " manure was also tested as to its manurial value. The substance, which consisted chiefly of a silicate of potash and alumina, was given in doses of 0.1, 0.5, 1.0 and 5.0 grams per pot. In all cases sufficient quantities of nitrogen, phosphoric acid and potash were given. The result obtained with oats on sandy soil was that the substance in question was completely harmless, but did not seem to promote the growth of the plants to any appreciable extent. Only with the large dose of 5 grams per pot was a small increase of crop obtained, and this barely beyond the limits of error.

4. — *Growth of plants in granite meal.* — In this series of experiments each pot contained 26 kg. (57 lbs.) of a powdered Swedish so-called " Stockholm " granite, the particles being of less than 3 mm. diameter. The experiments were conducted on the following plan :

a) Without manure.
b) Phosphoric acid + potash + lime (without nitrogen).
c) Nitrogen + potash + lime (without phosphoric acid).
d) Nitrogen + phosphoric acid + lime (without potash).
e) Nitrogen + phosphoric acid + potash (without lime).
f) Complete manure.

Of each combination three parallel pots were prepared. For the object of comparison there were also three pots with common earth taken from a field to which complete manure was added. Oats were used in the experiment.

It appeared from the experiment that the granite when completely manured or manured only with nitrogen and phosphoric acid gave yields as abundant as those from the completely manured field soil, and consequently able not only to satisfy the lime requirements of the plants experimented upon, but also their needs of potash. On the other hand, as was to be expected, this powdered granite had no effect as a nitrogenous manure and only a very slight one for phosphoric acid.

Recent investigations make it seem probable that the great effect of granite as a potash manure is principally due to its mica content.

The Present Conditions of Forestry in Italy

by

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In order to give an idea of the condition of our forest wealth and of the difficulties which are encountered in framing a single code of forest legislation without prejudice to the interests and customs of the population, it is sufficient to review rapidly the uncertain and desultory evolution of the laws in their hydraulic, economic, hygienic and pastoral aspects.

Between 1860 and 1877 every region of Italy had its own forest laws. In what had been the kingdom of Naples on the mainland, the law of Francis I of August 21,1826, which was extended to Sicily by the decree of March 26,1827, was still in vigour. It was perhaps wiser than the others and it might have been extended to the whole peninsula with advantage to the forest economics of the country. In Tuscany, after the edict of Peter Leopold of October 24, 1780, the greatest liberty prevailed. Piedmont obeyed the letters patent of Charles Albert, dated December 1, 1833, and January 28, 1834, and Sardinia those of September 14, 1844, and the decree of Victor Emanuel II of November 4, 1851, which was later extended to the Marches and Umbria. In Venetia and in Lombardy the decree of Eugene Napoleon of May 27, 1811, was still in force.

The Hon. Majorana Calatabiano attempted to remedy this want of uniformity in the legislation by means of the law of June 20, 1877, which is still fundamental in Italy It is very liberal, being based on the opinion that in order to promote forestry free competition is more advantageous than monopolies and servitudes, and that when the demand is greater than the supply there would be no lack of landowners who would be induced by the prospect of profit to grow timber. In this law liberty is thus the rule and servitude the exception, the latter being limited to those cases bearing upon watercourses, upon the protection of the land against erosion, etc., and upon public health, but without any consideration of economic, climatic or aesthetic factors. There was no provision for rendering reafforestation compulsory.

This law ushered in a great destruction of forests. Whilst the area of forests under the surveillance of the administration was 12 463 543 acres on January 1,1877, it was reduced to 7 402 395 acres on June 30, 1879, and by successive freeing from servitudes to 7 251 130 acres on January 1, 1900.

Too much trust was placed in the good effects of liberty and not enough consideration was given to the often imperious motives which induce landowners to fell their forests and to the difficulty of finding people willing to embark their capital in afforestation schemes trusting to the market conditions of a century later. Subsequent events proved that only a portion of these woods was destroyed with the object of transforming the soil they occupied into fields, meadows and vineyards, thus increasing the wealth of the country. The greater part of the forests were ruined by the excessive fellings to which the owners were driven by their straitened financial position and by the demands of the market. Concomitant causes were also the haphazard grazing and the primitive manner in which farming was carried out upon the cleared lands; usually after a few years they were abandoned to the action of the water, which leached them out and carried away the vegetable soil which had accumulated in the course of centuries.

It is believed that upwards of one-third of the forests freed from servitudes have already been ruined, and that another third is deteriorating so that before long it also will disappear. Some instances taken from official publications will give an idea of this work of destruction: In the Sila (Calabria) 77 341 acres of land freed from forest servitude were broken up and sown to rye, flax and potatoes, *the timber being burnt on the spot as it could not be sold*. In the province of Sassari (Sardinia), 407 550 acres of high forest and coppice were freed from forest servitude and the owners were left absolutely free to do what they liked with them. They paid no attention to either the preservation or the regeneration of the forests, because after the trees were felled, the unrestricted destructive grazing of all kinds of animals was allowed.

That the measures concerning the freeing of forest servitudes were very injurious and that the list of such abrogations were hastily drawn up, besides being full of errors and not sufficiently controlled, is proved by the fact that in many cases it has been found necessary to propose the reimposition of the servitude, and that in general, and especially along the Apennines and in Sardinia, many of the freed belts have become bare stony slopes, rocky precipices or steep clay banks burnt up by the sun, which seem to baffle every attempt to render them fertile or clothe them with forests by economical methods. Liebig used to say that a population that allows the fertilizing substances of its land to be carried into the sea during a century will be obliged to follow them and to emigrate, and Victor Hugo wrote: "*C'est la substance même du peuple qu'emporte, ici goutte à goutte, là à flots, le misérable vomissement de nos fleuves dans la mer*". This indeed has happened on the slopes of the Southern Apennines, where a part of the mischief is no doubt due to geological causes beyond the control of man; but by far the greater part of it is the effect of the wastefulness and neglect of man, who has paid no heed to the equilibrium of forces in nature and has not considered the far-reaching effects of his act.

There were not wanting scientists and parliamentary men who attempted to stay this continued work of destruction. But failure attended every effort to introduce a real forest law providing for the conservation and improvement of existing forests, for the afforestation and putting to grass of those lands that cannot be kept permanently under more profitable crops, for the extension of wooded pastures, for the conciliation of sylviculture with animal husbandry to the advantage of the inhabitants of the mountains, and lastly for means of prohibiting large landowners neglectful of their social duties from letting immense tracts of land go to ruin..

The Law of March 1,1888, on reafforestation, of which the Regulations for its application were not even published, had such meagre results, that it could be considered a dead letter.

From the official statistics it appears that between 1867 and December 31, 1904, the area reafforested at the expense of the Government or with its assistance amounted to 129 302 acres, with an outlay of £131 885. Thus in 38 years the area reafforested is 27 times smaller than that freed from servitude in the second half-year of 1877. It seemed as if an adverse destiny weighed on Italian forests, and even after some disastrous inundations the remonstrances in the Chamber of Deputies failed to obtain a satisfactory solution of the forest question.

Guido Baccelli, who in spite of the ridicule of his adversaries had founded experimental school gardens and instituted Arbor Day, has the merit of having succeeded in putting through the first Bill (that of December 29, 1901) affirming the aesthetic importance of forests; this further set aside as health resorts the celebrated forests of Vallombrosa, Camaldoli and Boscolungo in the Tuscan Apennine, the Cansiglio forest in the province of Belluno and the Ficuzza forest in the province of Palermo. Baccelli also had the courage to present a Bill on April 26, 1902, subjecting to servitude every wood in the kingdom whatever its position ; but this was, doomed to failure, and after having been approved by the Senate it was buried in the offices of the Chamber, notwithstanding that it contained the germs of that new feeling for forests which was so soon to bear fruit and to usher in the period of the restoration of woods. Thus on June 26 the measures for the protection of forests in the Sele catchment basin were approved. This step, for the first time in Italian legislation, affirmed the principle admitted by the Romans that forests supply the sources of rivers and regulate their course.

On March 31, 1904, the law on Basilicata came into force ; in imposing the forest servitude, this recognises, besides the interests of the hydraulic and hygienic conditions, the economic factor also. It provides for exemption from land tax in favour of those who reafforest, and grants them prizes, and it authorizes the outlay of £856 400 for the regularization of the watercourses in the plain and in the mountains, including the work of reafforestation and of strengthening the slopes.

The law of June 25, 1906, on Calabria confirms the exemptions from land tax and the giving of prizes in favour of those who reafforest, and votes £935 700 for the regularization of the watercourses in the plain and in the mountains, £352 000 for drainage, and £137 400 for consolidating slopes that threaten inhabited centres with landslips.

On July 19 of the same year the law on Vesuvius was passed; it authorizes the outlay of £234 000 to repair the damage caused by the eruption and by the subsequent downpours, and to provide for the regularization of the watercourses and woods, besides a further £80 000 for the same regularization on the southern slopes of Vesuvius.

On May 5, 1907, the law on the Water Board for the provinces of Venetia and of Mantua was passed. This provides one administrative office for the control of the public waters in the provinces of Venice, Padua, Treviso, Vicenza, Verona, Rovigo, Udine, Belluno and in that portion of the province of Mantua lying between the Po and the Mincio; this law is the beginning of a wise decentralization in the management of waters and forests.

On November 10, 1907, the measures for Sardinia were approved, and on April 5, 1908, a sum of £8 000 was voted to assist the work of improving the pastures, preference being given to those belonging to communes and associations.

On June 2, 1910, Luzzatti's law was passed for the constitution of a vast State forest domain and for the protection and encouragement of sylviculture, and on December 22 of the same year another law on the works to be carried out on the waters and forests of mountain basins was approved. It allows the outlay of £ 198 000 in the first five years and £ 793 000 in the next fifteen years. On July 13,1911, another law on mountain basins, water control and drainage was approved.

The last statistics published (on December 31,1907) refer to the forests subject to forest servitude. The figures are reported in the agricultural land book (catasto) of 1910, together with the area of woods not subject to forest servitude; these (including chestnut woods) are given in the following table:

	Under forest servitude	Free from servitude	Total
	acres	acres	acres
High forest	3 840 850	1 449 186	5 290 036
Coppice	3 512 340	2 470 000	5 982 340

The total wooded area from 1870 to 1910 was as follows:

In 1870, according to Maestri	In 1894, according to the *Annuario Statistico*	In 1902, according to Stringher	In 1910, according the agricultural land register
acres	acres	acres	acres
12 430 624	11 132 854	9 666 943	11 277 396

The above figure for 1910 is 17.03 per cent. of the area of the country.

The values of the imports and exports of forest produce and of forest industry during the last eleven years have been as follows:

Year	Imports	Exports
	£	£
1900	2 455 342	387 613
1901	2 557 237	412 301
1902	2 565 494	439 561
1903	2 718 190	472 271
1904	2 072 481	409 650
1905	2 202 599	300 252
1906	3 983 540	284 704
1907	4 734 132	287 440
1908	5 474 484	319 239
1909	9 355 083	237 205
1910	6 300 728	267 013

There are no precise data as to the yearly production of timber, but an approximation is given by the following table based on the calculation that an acre of high forest yields 36 cub. ft. of wood, an acre of coppice 43 cub. ft., and the 29 million acres of fields, wooded pastures, brushwood and hedges yield 7 cub. ft. per acre.

Production of timber, in cub. ft.

From high forest	From coppice	From the fields	Total
189 097 566	256 613 000	212 000 000	657 700 000

The insufficiency of normal production has been hitherto met by excessive felling, which has encroached upon the capital of timber, and by importation, which increases to an alarming extent.

The law on the forest domain has considered the difficult problem of the restoration of forests with great breadth of view and has attempted to remedy the fundamental defect of the present servitude, which on the bare lands ends by causing much harm. It is injurious inasmuch as it forbids the breaking up of the land to convert it into fields and meadows, which would often protect the soil exposed to the erosion and washing away by torrential rains: further, as it is not connected with the positive duty of reafforesting and of consolidating slopes liable to landslides, it is an encouragement to inertia. The law on the forest domain considers the problem from the standpoint of public utility, not only as connected with the hydraulic, hygienic and economic aspects, but also with the aesthetic and historical ones. Due attention is also paid to those forests which provide the only work available to the inhabitants of mountain communes. But it was not enough to provide for the defence of the soil by the improvement of the watercourses and of the forests; it as also necessary to increase our forest domain, by creating large extents of forest sufficient to meet the future penury of timber from which our country will certainly suffer. Thus betimes the administration will purchase bare lands suitable to profitable afforestation and badly managed woods, taking the place of private ownership which can ill afford to wait a long time for the returns. The administration will also exert the necessary persuasion on corporations and private owners by setting an example of good management and will also assist them by means of active propaganda, advice, technical direction, prizes and exemptions from taxation calculated to render forestry in the mountains more profitable and consequently preferable to other forms of exploitation. The forest officials should become the natural protectors and advisors of those engaged in forest industries; they must make a radical change in their tactics, which can no longer consist in perpetually threatening penalties against the destroyers of forests, as this system has proved ineffectual for the maintenance of existing forests.

For the execution of this vast programme, which includes also the reform of education in forestry, considerable sums have been voted; for the first five years (July 1, 1910, to June 30, 1915) these will vary between £ 1 150 000 and £ 1 300 000 according to the eventual surplus in the general budget of the State.

After the first trial five years, and considering the results obtained during that time, the future yearly vote will be established. A rather optimistic estimate compiled in 1910 by the Central Inspectorship of Forests for the General Budget Committee, suggested the possibility for the State of ensuring by means of an outlay of £ 6 185 000 to be spent in 25 years a forest domain which in its seventy-fifth year would be worth almost 60 millions.

Other provisions, apparently less important, but of great practical value for those who know the useful conservatism and the injurious passive resistance of bureaucracy, are those concerning the establishment of a purely technical general direction relatively independent, distinct from the water, drainage, domain, and easement services and from territorial divisions, and resembling the Water Board of Venice and the chief inspec tion offices of the civil engineering service.

This law, the result of much study, has a clear vision of the best way of attaining its object, and is the greatest parlimentary achievement in forest matters since the union of the kingdom.

Forest legislation has progressed considerably since 1902, and almost every year it has been increased by a new law. Now, rather than by the enactment of new laws which would risk plunging us into the same chaos that existed before 1877 and keeping us in the midst of proposals instead of facts, it would be desiderable to solve the forest question by means of the existing laws, applying them firmly and perseveringly. If there is one measure necessary to restore to the mountains their wealth of water and forests, it is the tranquil constancy of direction which will enable the owners of forests to proceed quietly and continuosly in their work like nature herself.

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The Selection System in Forest Economy

by

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The selection system (" Plenterbetrieb ") is the oldest method of forest exploitation, for it was practised when the science of forestry was still in its infancy ; further it is the system of exploitation which most closely resembles the operations of Nature.

The literature dealing with the selection-forest (" Plenterwald ") is unusually rich, and there is scarcely any other question connected with forestry upon which the opinions of experts are more diametrically opposed. In the case of such a forest, it is very easy to draw false conclusions from unsuitable subjects or from the results of wrong management. The modern forester regards the selection forest with a certain lofty contempt, and thinks its existence is only justified where it affords protection or for forests under servitude.

In Austria at the present time, this system is usually confined to the upper limits of the forests and to very steep slopes and small areas under servitude which are required to furnish a yearly supply of wood. The rotation is, as a rule, fixed at from 140 to 160 years, though in exceptional cases it is prolonged to 200 years. In this manner, the selection system is very often applied to stands of trees all of the same age, and frequently of much reduced seed production owing to their advanced age. To convert such stands into a selection-forest is no easy matter, and is effected in the following way.

A careful preparatory felling is carried out for the purpose of removing from the stands all diseased trees and some of the unshapely trunks, as well as the dead ones. This is succeeded, after some years, by very careful thinning 10 per cent. at most of the mass being removed and great attention being paid to the selection of the trees which are to be felled. These thinnings, are repeated at intervals of 5 to 10 years and are carried out by removing groups of trees; due regard must be paid to the light requirements of the underwood which has already made its appearance. In case no regeneration has taken place, recourse must be had to planting.

A method of selection which entails the removal from the stands of the strongest trunks and the leaving of the diseased, unshapely and smothered ones which do not pay for felling, has no effect in promoting natural regeneration. The latter does not take place because no preparations have been made and the area thinned has been kept too dark; on the other hand, the damage due to felling and removal are clearly felt. The later clearings obtained in the same manner are generally equally unsuccessful. These failures, together with the great demands made upon the forestry staff, are possibly the cause of the selection system being regarded in Germany and Austria as an unsuitable and ineffectual method, and of its having fallen into much disuse.

Stands of the true selection-forest type occur in Austria usually in the high mountain districts, the so-called "Alpwälder"; owing to want of care and to some extent to frequent grazing by cattle, they generally make anything but a satisfactory impression.

It is no doubt the condition of these stands which has called forth the entirely unsupported statements that selection-forests yield wood of inferior quality because the breadth of the annual rings is too much influenced by the continual interchange of close and open stands; further, that such forests produce less timber than even-aged forests, because in the former the trunks are much shorter, more liable to decay and more branched.

These assertions cannot be regarded as of universal application, since the financial success of a well-managed selection forest does not suffer from short trunks, inferior quality of wood or too great abundance of branches. Forest Inspector Schatzle (Germany) has shown, for instance, that in the Black Forest of Baden the timber yield is 74 per cent.

The opinion of the well-konwn investigator Dr. Robert Hartig regarding the quality of the timber of selection forests is as follows: " The timber of these trees is of excellent quality ; in the selection-forest they grow close together and in deep shade when young and are gradually given more space. Their growth often increases up to 300 years, so that the width of the annual rings only decreases slightly towards the outside. With increasing growth the quality of the wood also improves up to a great age, and thus excellent timber is produced throughout ". In another place he says : " The most prized product is the fine-ringed timber from closed associations, especially the wood of stands derived from natural regeneration ".

With regard to the deficiency in wood and the branching of trees of the selection forest, the Austrian investigator, Josef Wessely, in his work "Die österreichischen Alpenländer und ihre Forste ", states as follows : " Growth to old wood is usually astonishingly regular. This is no less the case with longitudinal growth, though this is generally relatively greater than growth in any other direction, which is clearly due to the struggle to reach the light, and occasions a strikingly complete lignification of the stem.

" Under these conditions (large number of stems and pressure from above and at the sides) the branches are naturally unable to become thick, and the stems continue to shed them until they attain a great age ; hence of the unwonted cleanness of the trunks. ,,

This remark of the Austrian authority referring to the stands in coniferous forests, which perhaps now no longer exist in such an original form, gives us material for reflection. We have no right to call the selection system antiquated and ineffectual so long as we cannot bring forward convincing proofs the truth of this statement.

We now come to the principal question, *viz.* how the growth and timber yield of a selection-forest compare with those of an even-aged stand grown under open conditions.

Wessely has not yet given us a definite answer to this query. He does, however, maintain that in a spruce station spruce gives a better and more sustained growth in selection forests than in even-aged high forests.

Nowadays we often meet with the view that the yield of the selection-forest is on the whole low, and that great productiveness in the latter is only to be obtained in very favourable situations. This statement is incorrect. The yield of such a forest is certainly low at first, and much time, together with skilful management, are required before it can attain its full productivity, and before soil and stand reach a condition permitting a large quantity of timber of best quality to be obtained.

In a silver fir selection-forest near Rippoldsau in the Black Forest of Baden, Prof. Schuhberg measured in 1886 an annual increase of 263 cub. ft. per acre. A selection stand covering 250 acres in the parish of Schwappach in the Black Forest increased in mass between 1879 and 1899 by 249 cub. ft. per acre per year; these are unique performances which have not been equalled in even-aged high forests with similar growth conditions.

Large yields have also been recorded in Switzerland, the true home of forests of this type. Dr. Fankhauser showed in 1908, in the "Schweizerischen Zeitschrift für Forstwesen", that the selection-forests in that country gave an increase of from 143 to 176 cub. ft per acre at elevations of 800 to 1200 m. (2650 to 4 000 ft. above sea-level).

From these statistics, of which the accuracy is beyond any doubt, the increase in a carefully tended selection forest far exceeds that of an even-aged high-forest stand.

The greater resistance of the former, owing to the stand being composed of trees of different ages, is now fairly well known. Such a forest suffers little from heat and frost, snow and ice, insect and plant enemies. But it is otherwise with the injuries due to man. Unrestrained felling, the use of twigs for litter, the reckless employment of the forest as a grazing ground, have wrought havoc with many selection-forests. What the latter can withstand in this direction is shown in a striking manner by the peasants' woods of the Austrian Alps. These must eventually succumb to the continuous blows of the woodman's axe, and the ceaseless injury caused by grazing cattle; but they have resisted these attacks for an extraordinary length of time, and quickly recover, should a favourable chance give them a longer respite.

Thus about ten years ago, a peasants' selection wood in Lower Austria, which was in an extremely neglected condition, came into the possession of a high-minded lover of woodlands. The new owner at once put a stop to the forest's being exploited for timber and litter; the result was a quite incredible increase in growth, and the wood at present affords a charming picture. The stand has again become completely closed and trees of all ages show luxuriant growth.

To give another example: the so-called "Grassgelack" in the Salzkammer properties, which are burdened, and at times over-burdened, with rights of grazing and the collection of twigs for litter, are treated in an almost barbarous fashion. The grazing season begins on the first of May and the famished cattle fall upon the young tree-shoots because the grass has not grown sufficiently to satisfy their hunger. The damage caused by felling and timber removal is repeated every year; nevertheless, where the soil is best the trees are thick and their growth is satisfactory; it is only on the very poor dolomitic soil that the stands show gaps and that the growth is deficient. What, however, would have happened to these areas if clear felling had been adopted?

We will now turn to the effect exerted upon the soil by selection forests. No doubt now exists that continual protection not only maintains the good condition of the soil, but also increases it. The humus layer is especially useful, as the weathering of the mineral constituents of the subsoil is largely due to its agency. It is only in troughs or basins, where a considerable quantity of leaves collect and lie, that acid humus, unfavourable to plant growth, is formed. With the exception of such cases, and leaving out of account heaths and moors, the existence of a thick covering of humus cannot be other than advantageous to the growth of woody plants.

The continuous presence of a soil-covering and of the humus layer are certainly of effect in improving the soil. The surest proof of this is given by the primaeval forests. In those of North America, which, alas, will all too soon belong to the past, the indigenous species of trees (*Abies douglasii*, *Pinus ponderosa*, *Wellingtonia gigantea*, etc) have attained giant dimensions. These American species will never reach this size in our ordinary forests, though they would grow as large in Austrian primaeval forests as in those of America.

The soil conditions of a carefully tended selection-forest resemble those obtaining in a primaeval forest. In the former the soil is continually protected and covered, and is sheltered from the drying effects of sun and wind; the supply of humus increases, the physical and chemical composition of the soil gradually improve, the quality of the soil improves, and for this very reason the selection-forest is highly productive.

Now Fürst (Germany) has stated in his work entitled " Plenterwald oder schlagweiser Hochwald " (1885, p. 28) that the first requisite for success with the selection system, or this combined with the compartment system, is good damp soil, as only on such can our indigenous trees support heavy shading and repair injuries of all kinds. The selection system cannot be practised in poor, dry situations.

Assuming this to be correct, we must draw the conclusion that it is just in the case of poor soil that we must dispense with the very system of cultivation from which we have every right to expect improvement in the soil conditions, and are forced to fall back upon the method which appears the worst both from the forestry point of view and from that of maintaining the quality of the soil. *i. e.* we must choose the clear felling system for inferior soil. This assumption should, however, be regarded as quite unwarranted. For in the Austrian Alps there are many wooded areas which after clear felling could not be reafforested, but gradually degenerated into " Karst " in spite of every care and attention and great financial sacrifice, while neighbouring stands managed according to the selection system, but without receiving any special attention, are in a very satisfactory condition. Central Director Hufnagl has shown in his article " Der Plenterwald, etc. ", which was published in 1893 in the " Oesterreichishe Vierteljahrschrift für Forstwesen " that a selection-forest on rocky " Karst " ground with scanty soil produces an increase of timber of 93 cub. ft. per acre per year.

In this connection he says : " If we compare with this annual increase of 93 cu. ft., or, what is the same a yield of 93 cub. ft. of timber per acre per year, the figures given in tables showing the product of stands of the same size and growing on soil defined as first class, and take Feistmantel's sixth sub-class of silver firs, we find we have in the 120th year a mass of wood, inclusive of faggots, of 9250 cub. ft. and an average increase of 77 cub. ft.; if we subtract 25 per cent. from this for faggot wood, there remain 6850 cub. ft. of timber in the 120th year, giving an increase of 57 cub. ft. per acre per year.

"Now a typical spruce trunk in an even-aged stand of 120 years is about 11 inches in diameter, while the selection-forest produces trees from 16 to 22 inches in diameter, so that the timber is of much greater value".

Hufnagl says further: "The selection system, which is pointed out as the most extensive method, really represents an individual tree management. This is well known to be our most intensive method". He concludes his observations with the following words: "Where different conditions of stands already exist these should be retained, no attention being paid to this or that prevailing fashion in forestry; for only extensive local experience should or can be the foundation of changes in methods of cultivation. Hours of calculation cannot prove what can be demonstrated in one minute by the callipers and the increment borer."

From the preceding observations we therefore conclude that the selection forest owes its great powers of increase, not to its favourable position, but rather to the careful management of the trees, and the consequent improvement of the soil. If we were to make a clear cut of such a forest, the reserve treasures of the soil would be dissipated in a few years, either by leaching or by the growth of weeds; the weathering of the mineral subsoil would be interrupted, and, under these circumstances, there could be no question of reafforestation.

There is a splendid selection-forest of spruces in the Royal Forest of Panaveggio (South Tyrol), which has been described in glowing terms by all who have visited it. Wessely describes it as follows: "The Panaveggio timber is renowned for its excellence as far as Verona and Venice. It is distinguished by its unusual thickness, its narrow annual rings and freedom from branches, as well as by extreme durability. This well-managed selection-forest is an almost closed high forest, and only differs from ordinary old stands of even-aged trees in the fact that its trunks are not so equal in diameter and that some poles, as well as occasional saplings, occur between the older trees".

In this forest, standing at 1600 to 1800 m. (5000 to 6000 ft.) clear felling would be entirely out of place, all the more so that different stand conditions are already in existence, and according to Hufnagl these ought to be maintained.

For our high mountains the selection system is of incalculable advantage and is often the only possible method. Those who regard it as an antiquated system excluding all idea of progress have no conception of the difficulties attending high mountain forestry.

In a work published in 1911 and entitled "Die intensive Bewirtschaftung der Hochgebirgsforste" (The Intensive Management of Mountain Forests), I have (on page 33) spoken against a too long rotation in the case of woods on steep slopes treated according to the selection system; I maintained that the rotation period in such cases should correspond with the shortest period necessary for the trees to reach maturity and to acquire utilisable dimensions, because in this manner natural regeneration takes place readily and as the trees are not so large as they become when older, their removal is easier and damage due to felling can better be avoided.

In explanation I should here like to mention that I did not wish to say anything against the selection-forest, but in making these remarks I had in my mind the fact that stands on steep slopes treated according to the selection method, are usually composed of trees of the same age and are often very old; hence careful management is necessary and proper transport arrangements are indispensable.

We have now reached the most necessary condition for the practice of the selection system, *viz.* the opening up of the several forest districts by establishing well-planned transport stations.

In my above-mentioned work I said in this connection: "It has been shown to be an absolute necessity to open up our high mountain selection forests by means of flumes, timber tracks, etc., which will connect with the chief transport stations, and also to make the rotation period as short as possible; only thus shall we obtain a good supply of utilizable timber from such forests and ensure natural regeneration".

This condition applies not only to the high mountains, but also to the lower mountains and the hills, and where it is not fulfilled the careful forestry required by the selection-forest is not possible.

Unfortunately, as a rule the actual circumstances are very different. There are no transport stations in the mountain forests treated on the selection system. The timber is conveyed to the valley in the most primitive manner, usually by means of badly constructed earth slides, often even down precipices. In these forest areas, the selection is generally limited to the removal of dead and harmful trees, while in many instances such stands are completely left to themselves.

In the lower mountains and hills similar conditions, though perhaps not quite so unfavourable, prevail. The selection-forest is not regarded as a true commercial forest; it receives scant attention and the provision of good, adequate transport stations is considered unnecessary, probably from the idea that the yield of such a forest is small in itself and does not justify even a small outlay for opening it up.

With regard to wood transport and its cost, the selection-forest is always at a disadvantage when compared with clear felling, *i. e.* the expenses of transport are under all circumstances heavier. Even if it is arranged that longer intervals, say 20 years, shall be left between each felling, so that the supply of wood shall be fairly large, still the disadvantage remains that the same amount of timber which occupies one acre in the clear felling, is scattered over 5 to 10 acres in the selection-forest.

Marking trees for felling in the latter is difficult, and takes much time. Even with the greatest care, injuries due to felling cannot be avoided.

These are briefly the chief reasons of the objection to the selection system.

In addition, the foresters of the present day, whether in the service of the State or of private individuals, are overwhelmed with secretarial work to which they devote all their spare time. Too little time thus remains for forest management, or the solution of questions of pure forestry. In the Austrian Forest Service marking trees for felling is one of the most important duties of the Forest Superintendent. In the instruction of the Staff of Management of the Imperial Forests and Domains, special stress is rightly laid upon this duty. Where the forester is overwhelmed with secretarial work it is but natural that he should prefer the system which requires of him the least expenditure of time, and this is clear felling. The arrangements for management, also, are not favourable to the selection-forest. The estimation of the yield of the selection-forest presents too great difficulties, although owing to the work of Hufnagl, Tichy and other experts, the methods to be observed seem to have been clearly and indubitably set forth. The mass and yield of an even-aged forest are much more easily calculated, and as all managers work more or less according to one or other scheme, and have usually very large tasks to accomplish, they naturally from their point of view prefer those systems of forestry which are based on stands of the same age, and certainly by preference on clear felling with subsequent artificial regeneration. Here, no doubt can arise as to the mass and increase of the stands, the stand charts give a clear picture of the age of the different stands, and estimates of the capability are quickly and easily made.

It is the calculators of net returns who least approve of the selection-forest, because it is absolutely impossible to strain it into mathematical figures. Their calculations break down when applied to woods containing trees of different ages, but especially in the case of the selection- forest, for factors creep in whose importance cannot be estimated.

It should therefore cause us no surprise if the selection-forest finds so few advocates amongst the foresters of the present day. It is the system which makes the greatest demands upon the forester, provides him with difficult questions to settle and is a complete failure if practised superficially and with insufficient insight.

But in spite of all opposition, the introduction or retention of the selection system is undoubtedly to be recommended where it is a question of the uninterrupted maintenance of a high crop, as in the cases of protection forests under servitude, small areas supplying forest dwellers with wood, or peasants' forests which supply the domestic needs of their owners.

It is in Switzerland that selection-forests are most prized; here the importance of this system from the standpoint of rural economy is recognized and fully appreciated. Quite independently of the important part played by the selection system in the case of protection forests, it is the high yields of the very well managed selection-forest which have won for it enthusiastic supporters, especially the Forestry Inspector of the Confederation, Dr. Fankhauser.

I have myself visited some of the Swiss selection-forests, notably those in the Canton Graubunden, and was delighted with their beauty and the care with which they are managed. Excellent transport stations also are not wanting; as a rule these are used for alpine economy, as well as for wood transport.

In this connection we should do well to take Switzerland as our model.

Results of Drilling Manures in Hungary

by

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Until recently in Hungary chemical manures were generally spread by hand or by machines which distributed them very evenly over the surface of the soil; but the experiments made during the last ten years have shown that in Hungary, especially in the dry regions (first among which is the great Alföld plain) artificial manures, with the exception of nitrate of soda, are more certain in their action if they are applied before sowing and at the same time buried to a depth of 5 to 6 inches.

Consequently, in 1909, when the distributor Record II, made at Losoncz in Hungary, was adopted for drilling the manures and seeds together, it was natural that it should have been looked upon with distrust by farmers as being contrary to their fundamental principles of manuring. For this machine deposits the manure and seed together in the same drill, on the principle that more fertilising material is readily available to the delicate seedlings and promotes their rapid and vigorous growth. Unlike other distributors it does not deposit the manure first and then the seed, but possessing only one tube it supplies both at the same time to each coulter and is consequently of simpler construction and of much easier draught than machines with separate tubes and coulters for the seed and manure. In fact, except for the weight of the manure box (built on Schlöer's system), it is not heavier than an ordinary seed drill, a point of considerable practical importance. Considering the following results of experiments, there is no reason to believe that manure so applied has any effect on the germinating power of the seeds, and no doubt remains as to the efficiency of the method

Two great advantages of this method are: that one-half of the quantity of manure is enough to secure remunerative results, and the cost of working is considerably reduced, as the machine Record II performs at the same time the two operations of manuring and seeding. These economies themselves are sufficient to rouse the interest of Hungarian farmers, and experiments carried out to determine how far these advantages can be realised are summarised in this article. They were commenced in 1909 and were carried out on land in various parts of Hungary and continued during successive years of varied character; the above-mentioned machine was almost exclusively used. The results given below have been collected from those published in the various agricultural journals of Hungary. They are divided into three groups as follows:

1). Effect of manures in drills compared with unmanured plots.
2). Manure in drills compared with manure broadcaste ..
3). Distribution of manures other than superphosphate, particularly nitrate of soda and 40 per cent. potash.

The general poverty of Hungarian soils in phosphoric acid (owing to the extended cultivation of cereals) favours a greater response to applications of superphosphate; though there is frequently a need for nitrogenous and potash manures, phosphatic manures are most commonly in use throughout the country. This fact, along with the introduction of this distributor has done much in determining the value of drilling manures.

EXPERIMENTS WITH WINTER CEREALS.

The results are summarised in Tables I, II and III.

TABLE I. — *Wheat.*

Year	County	Soil	Quantity of superphosphate applied per acre		Increase in yield over control plots, per acre		Value of increase after deducting cost of manure, per acre	
			in drills	broad-casted	in drills	broad-casted	in drills	broad-casted
			lbs.	lbs.	lbs.	lbs.	£ *s* *d*	£ *s* *d*
1909 10	Pest, Pozsony and Nograd (3 estates)	clay humic clay	124-139	—	202-744	—	0 11 10 to 2 16 1	—
1910-11	Komárom, Pest and Alsófehér (5 estates)	clay . .	109-117	—	434-496	—	1 12 1 to 1 17 6	—
		sandy humus . .	124-139	—	434-511	—		
1911-12	Komárom and Alsófehér (3 estates)	clay . . sandy humus . .	124-139	—	234-248	—	0 12 10 to 0 14 1	—
1911-12	Nográd, Fejer, Pest, Szatmar, Arad Aranyos-Torda (8 estates)	clay . .	124 *	240 *	509	383	1 18 2	1 3 5

* Cost of manure — in drills 4*s* 2*d*; broadcast, 8*s* 4*d*. The figures in this line represent averages.

TABLE II. — *Rye.*

Year	County	Soil	Quantity of superphosphate applied		Increase in yield over control plots		Value of increase after deducting cost of manure	
			in drills	broad-casted	in drills	broad-casted	in drills	broad-casted
			lbs.	lbs.	lbs.	lbs.	£ *s* *d*	£ *s* *d*
1909-10	Nogràd, Fehér and Gyor (3 estates)	clay	124-139	—	357-387	—	1 2 9 to 1 4 1	—
1910-11	Komárom and Fejér (3 estates)	sand clay	124 124	— —	240 690	— —	13 6 2 8 2	— —
1911-12	Nográd, Fejér Zemplén Szatmár (5 estates)	clay loam	167	244	351	221	1 0 10	0 8 4

N. B. — The results of 1910-11 and 1911-12 represent averages.

These results show that with winter cereals, superphosphate applied in drills has given large increases in yield over the broadcasted as well as over the unmanured plots, and that a small quantity of manure drilled in with the seed can produce as good or even better yields than a large quantity broadcasted. In several cases shown in Table III only half the quantity of manure applied in drills was required to produce equally and even slightly more paying results.

TABLE III.

District	Soil	Quantity of superphosphate applied, per acre		Increase in yield over control plots, per acre	
		in drills	broadcasted	in drills	broadcasted
		lbs.	lbs.	lbs.	lbs.
I. - *Winter Wheat.*					
Nográd	Clay	93	186	497	465
Fejér	Humic-clay	116	232	744	713
Arad	Clay	155	310	439	399
II. - *Winter Rye.*					
Gyor	Clay	101	202	694	740

In other cases the best results were obtained by drilling quantities of superphosphate exceeding half the dressing broadcasted.

EXPERIMENTS WITH SPRING CEREALS.

These experiments were conducted with two-rowed brewing barley and oats. Experiments in Hungary have shown that in manuring spring cereals having a short vegetative period, it is necessary to apply the manures well in advance of the sowing to obtain their full effect. It was therefore to be expected that drilling the manures with the seed would give a negative result.

1. *Two-rowed spring barley.* — The results of 1909 were obtained in one district only, a clay soil in the county of Nograd. They are summarized in Table IV.

TABLE IV.

		Manure		Increase over control plots	
292	lbs	Superphosphate	broadcasted	544	lbs.
101	»	»	drilled.	653	»
147	»	»	»	653	»
194	»	»	»	601	

In 1910, three estates (counties of Nográd, Pozsony and Pest) manured with 124 to 155 lbs. of superphosphate applied in drills gave an increased yield of 202 to 263 lbs. on loamy soil, and 496 to 883 lbs. on a humic clay soil, making a net profit of 8*s* 4*d* to 11*s* 6*d* and £1 7*s* 7*d* to £2 13*s* 11*d* respectively.

In 1911 experiments were carried out on eleven estates to compare the yields of unmanured plots with plots manured in drills, and drilling with broadcasting the manure. In two estates (in Komárom) on sandy humus, 124 lbs. of superphosphate applied in drills increased the yield of grain by 216 lbs., and in another district (Kisküküllö) on a sandy soil, 155 lbs. of superphosphate gave an increase of 635 lbs., or a net profit of from 9*s* 11*d* to £1 13*s* 11*d*.

Table V shows the average increases obtained on 7 estates (Nográd, Kolozs, Nagyküküllö and Aranyos-Torda counties) on loam and humic clay soils.

TABLE V.

		Manure		Increase in yield of grain over control plots	
202 to 232	lbs.	Superphosphate	broadcasted	124 to 611	lbs.
78	»	»	drilled	233 » 326	»
116	»	»	drilled	210 » 528	»
155	»	»	»	410 » 736	»

The results obtained on two estates have provided interesting comparisons of the influence of cultivation and seed time on the increase in yield produced by applying chemical manures broadcast and in drills.

The increases in the yield of barley over the control plots, sown at the end of April after spring cultivation, are as follows :

					Increase	
232	lbs.	of	superphosphate	broadcasted . . .	145	lbs.
116	»	»	»	drilled	456	»

Barley sown in the middle of March after autumn cultivation and harrowing in the spring gave the following increases :

				Increase		Value
232	lbs.	of superphosphate	broadcasted	611	lbs.	£1 12*s* 8*d*
116	»	»	drilled	582	»	£1 9*s* 10*d*
155	»	»	»	738	»	£2 4*s* 10*d*

These results show that artificials broadcasted, and still more those drilled, exerted a greater influence on barley sown at the beginning of spring on soil ploughed in the autumn. In 1912, on four estates (counties of Komárom, Sáros and Aranyos-Torda) on clay and humic clay soils, the following results were obtained :.

					Increase	Value
232	lbs.	of	superphosphate	broadcasted	294 lbs.	11*s* 2*d*
116	»	»	»	drilled	238 to 651 lbs.	11*s* 7*d* to £ 1 19*s* 1*d*

2. *Oats.* — Experiments conducted on ten estates have given the same results as those obtained with barley. Applications of 93, 116 and 124 lbs. of superphosphate in drills have produced greater increases than broadcasting 186 and 232 lbs. In this case also the time of cultivation of the soil and of sowing have considerable influence on the action of the manure applied in drills. Oats sown late (at the end of April) after spring cultivation gave the following increases :

					Increase	
93	lbs.	of	superphosphate	in drills	115	lbs.
116	»	»	»	»	112	»

Whilst oats sown early (in the middle of March) after autumn cultivation gave the following :

					Increase	
98	lbs.	of	superphosphate	in drills	181	lbs.
116	»	»	»	»	183	»

3. *Spring wheat.* — Comparative experiments were made only in 1911 on three estates (Kolozs and Szolnok-Doboka counties) on clay soil, with the following results :

		Increase
116 lbs. of superphosphate	in drills	191 to 208 lbs.
170 » » »	»	574 »
232 » » »	broadcasted	62 to 232 »

These results also show that in drilling manure, half the quantity usually broadcasted is not sufficient, and that the best results are obtained by applying a larger quantity than this, namely 170 lbs.

The results of these experiments made between 1909 and 1912 may be summarised as follows.

1. Superphosphate applied in the drills with the seed has no corrosive or injurious action on the germinating power of the seeds in either dry (1911) or wet seasons (1912). Even quantities as large as 232 lbs. have no injurious action on germination. In fact the germination of the seeds sown with manure is more rapid and uniform.

The corrosive action of superphosphate when drilled in, and the decrease of germination and lower yield, were only observed when the pickled seeds were not sufficiently dried before sowing. Some experiments on barley and oats with mixtures of nitrate of soda and superphosphate have shown that even with doses of 93 lbs. of nitrate and in direct contact with the seed, germination was not at all impaired.

2. The majority of experiments have shown that manuring in the drills is more profitable than broadcasting, because of the economy of the manure. As a rule half the usual quantity of manure sown in this way is sufficient; there are exceptions and it is necessary to determine the correct quantity for each estate by comparative experiments.

Manuring in the drill, however, does not produce better results in the second year, but this is of little consequence, since it is in the best interests of the farmer to obtain his maximum yields in the first year, and it is not difficult to repeat the application each year, especially with small quantities, all the more so as it does not cost extra labour, for the same machine drills seed and manure together.

3. This method of manuring also gives considerable increases in the yield of straw, which is a distinct advantage with the straw of spring cereals (barley and oats) which is used as fodder.

4. In the dry season of 1911 the superiority of drilling in the superphosphate with the seed was particularly evident and there appeared to be sufficient moisture both for the germination of the grain and the decomposition of the manure.

5. Whenever no result was obtained by drilling the manure none was obtained by broadcasting it and every experiment successful with broadcasting was also successful with drilling the manure. Four years' experiments under the most varied conditions of soil and climate have shown that a soil particularly responsive to dressings of superphosphate responds most when it is applied in drills.

6. Manuring in drills has also in most cases a beneficial effect on the quality of the grain, *i. e.* the weight per bushel.

EXPERIMENTS ON SUGAR-BEETS.

The best results have been obtained in these experiments. In many cases sugar beets do not respond at all to artificial manures broadcasted but a small quantity drilled in with the seed is very effective. The manure being readily available to the seedling, enables it to grow out of the dangerous period quickly and become established with greater vigour than with broadcasted manure.

This was evident in the experiments of 1909-12 and farmers are unanimously agreed that sugar-beets manured in the drill germinate more quickly and uniformly and that their subsequent growth is more vigorous and resistant to drought than when they are manured broadcast.

The results in Table VI were obtained on six estates (Pozsony, Nyitra, Nográd and Csanád counties) on clay and humic clay soils.

TABLE VI.

Quantities of superphosphate	Increase in yield	Value of increase
302 lbs. broadcasted	775 to 4495 lbs.	— 1*s* 7*d* to 17*s* 8*d*
93 to 108 drilled	3100 » 4495 »	19*s* 10*d* » £1 14*s*
155 » »	5425 » 6200 »	£1 19*s* 9*d* » £2 6*s* 2*d*

The following are the results obtained by using a mixture of superphosphate and nitrate of soda.

Manures	Increase in yield	Value of increase
116 lbs. of superphosphate + 46 lbs. of nitrate of soda in drills	9145 lbs.	£3 6*s* 9*d*
232 » + 93 » » broadcasted	3875 »	18*s* 3*d*

The injurious effects of nitrate of soda on germination were only noticeable when it was applied in larger quantities than 93 lbs., in which case it prevented uniform germination and diminished the yield.

In the county of Csanád on a humic clay soil it was found that the addition of 78 lbs of 40 per cent potash to the mixture of superphosphate and nitrate of soda produced when drilled a quicker and more uniform germination than when the potash manure was broadcasted, and that moderate applications of potash did not have an injurious effect on the germination of the grain when drilled with it

Manuring in the drill does not decrease the proportion of sugar in the beets, but on the contrary in some cases it increases it Similar results have also been obtained with mangels The seedlings of both plants are more resistant to root disease ("Pied noir" or "Wurzelbrand") when manured in this way.

The undoubted success of these experiments both in the dry season of 1911 and in the wet year 1912 makes it very probabe that this system of manuring in the drill will be generally adopted in agricultural practice.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

1230 - **Law of July 2, 1913, Encouraging the Replanting and Preservation of Private Forests in France.** — *Journal officiel de la République française*, Year 45, No. 181, pp. 5809-5810, and No. 274, p. 8911. Paris, July 6 and October 9, 1913.

Art. 1. — The undermentioned lands are to be administered by the Forest Office according to the provisions of the Code relating to woods belonging to public bodies:

1) Woods and forest belonging to Departments.

2) All forests, woods and lands reserved for planting belonging to recognized societies of public utility and approved mutual aid societies.

Art 2. — The second paragraph of article 11 of the law of July 1, 1901, concerning deeds of partnership to be terminated as follows:

" Woods, forests and land to be planted may be acquired, either by purchase or gratuitiously ".

Art. 3. — The Forestry Administration is empowered to take charge, either wholly or in part, of the preservation and management of woods belonging to persons or societies, in consideration of an annual payment according to the terms of agreement, which shall be made for a period of not less than ten years. Applications to be made to the Conservator of Waters and Forests in the district in which the property is situated.

The provisions of articles 91, 97, 107 (§ 2), 108 and 109 (§1), relating to woods belonging to public bodies, those of section 1 of chapter XI, with the exception of paragraph 2 of article 169, those of paragraph 2 of article 189, and those of section 1 of chapter XIII, to be applied to these woods.

All agreements and sales not authorised by the forest administration or not conforming to their conditions, effected by the proprietors or administrators of these woods who have allowed to third parties rights of use, or have proceeded to cut timber, are declared null and void.

Art. 4. — A sum equivalent to the anticipated income of the fees of administration paid by recognized societies of public utility, approved mutual aid societies, and by individuals and other societies, to be placed at the disposal of the Forestry Administration in payment of the supplementary expenses of administration.

Art. 5. — All acquisition of woods, forests and lands to be planted will be worked according to the provisions of article 10 of the law of July 20, 1895, and will be included in investments effected by means of the local savings bank, provided that the total acquisitions shall not exceed one-tenth of the personal capital.

Art. 6. — The conditions of working of the present law will be determined by an order of public administration.

EDUCATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY

1231 - **The Agricultural and Forestry Colleges and Schools in Austria in the Scholastic Year 1912-13.** — *Land- und forstwirschaftliche Unterrichtszeitung,* Year XXVII, Part I-II, pp. 55-107. Vienna, 1913.

The number of Agricultural and Forestry Colleges and Schools in Austria during the scholastic 1912-1913 amounted, including the Brewing and Distillery Schools, to 226. The new colleges and schools opened since the previous year included the Agricultural School (Mittelschule) at Kloster-Hradisch, 5 Agricultural Winter Schools, 2 Housekeeping Schools, the Winter Agricultural and Horticultural School at Schnobolin (Moravia), and the Fruit-growing School at Wisowitz (Moravia).

The following Schools have been closed: the School of Agriculture and Hop-growing at Kloster-Hradisch, two Winter Schools, one Housekeeping School and the Brewing School at Mödling.

The 226 schools include: 3 Colleges or divisions of Colleges, 3 Agricultural and 1 Brewing Academy, 9 Agricultural and 5 Forestry Middle Schools, 2 Technical Middle Schools for Vine and Fruit-growing and Horticulture, 42 Agricultural Schools, *i. e.* Lower Agricultural Schools with instruction throughout the year, 91 Agricultural Winter Schools (19 of these also hold a summer housekeeping course), 11 Lower Grade Forestry Schools, 4 Dairy Schools, 22 Housekeeping and Farm Schools, 30 Lower Grade Special Schools for horticulture, the cultivation of fruit, vines, vegetables, flax and hops, for the cultivation of meadows and for Alpine farming and beekeeping, 1 Brewing and 2 Distillery Schools. The accompanying table gives the details respecting the number of students and teachers, and of the length of the courses in the single schools or groups of schools during the scholastic year 1912-13.

Colleges and Schools	Length of Course	No. of the Regular Staff	No. of Outside Teachers	Actual number of students in the beginning of March 1913
I. — *Colleges.*				
Royal Imperial Agricultural College in Vienna	4 years	63	26	1 159
Agricultural Section of the Cracow University	4 »	8	14	296
Agricultural Section of the Bohemian Technical College at Prague	4	21	18	176
II. — *Agricultural Academies.*				
Tabor (Bohemia)	2 »	10	8	146
Tetschen-Liebwerd (Bohemia)	2 »	27	2	64
Dublany (Galicia)	3	15	9	132
Brewing Academy in Vienna	2 »	4	19	17
III. — *Agricultural Middle Schools.*				
Agricultural at:				
Mödling	3 »	6	8	119
Chrudim	3	14	5	212
Kaaden	3 »	12	8	220
Randnitz a. E.	3	14	4	227
Kloster-Hradisch	2 »	6	1	61
Neutitschein	3 »	6	5	88
Prerau	3 »	9	4	123
Ober-Hermsdorf	3 »	9	4	55
Czernichów	3 »	10	4	62
Forestry at:				
Bruck a. d. Mur	3 »	5	5	43
Pisek	2 »	9	5	77
Reichstadt	3 »	8	1	93
Mährisch Weisskirchen	3 »	8	3	79
Lemberg	3 »	7	9	83
Higher School for Vine and Fruit-growing at Klosterneuburg	3	7	11	49
Higher Fruit-growing and Horticultural School at Eisgrub	3 »	4	6	58
IV. — *Lower Schools.*				
42 Agricultural Schools (1 for women)	2–3 »	175	194	1 508
91 Agricultural Winter Schools	1–2 »	251	610	3 370
11 Forestry and Woodcraft Schools	1–2 »	26	39	392
4 Dairy Schools	1 (one 2) »	19	9	52
22 Housekeeping and Farming Schools	1–2 years	100	63	630
30 Special Schools for Gardening, the Cultivation of Fruit, Vines, Vegetables, Flax, Hops, Meadows, and for Alpine Farming and Bee-keeping	1–3 »	91	90	816
3 Brewing and Distilling Schools	1 year	8	18	84

1232 – **Schemes for the Reform of Horticultural Education in Austria.** – SCHECHNER, KURT in *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVII, Part I-II, pp. 34-41 Vienna, 1913

The Imperial and Royal Horticultural Association of Vienna intends to carry out a thorough reform of the system of horticultural education The aims of the Society and the direction of their efforts are set forth in this article by its Secretary General.

According to this scheme, the first step will be the establishment of apprentice-schools, of which four are already founded. These are schools consisting of two classes in which instruction is given for nine hours weekly during the six winter months. The curriculum includes: 1) Technical and commercial instruction (the solution of commercial problems, arithmetic, book-keeping); 2) Civil law; 3) Drawing; 4) Horticulture (gardening, fruit-growing, land measurement, plant diseases natural history, seed growing; 5) Instruction in general subjects.

The gardener must look to the under-gardeners' schools for the continuance of his education. These also consist of two classes. Admission is granted on the production of a leaving certificate from the apprentice-school, or of a certificate showing that the candidate has completed the course of instruction. In these schools instruction is given in 18 hours of lessons a week during the six winter months. The curriculum includes: the German language, geography and civil law, arithmetic and geometry, chemistry, mineralogy and zoology, book-keeping and correspondence, botany and seed-growing, gardening, fruit-growing, plant diseases, landscape gardening, garden history, field measuring and management.

The writer considers that the travelling grant given to young students on leaving the apprentice-school is an important educational factor. By this means they are enabled to travel and also to work abroad. Opportunity should also be afforded from time to time to the educated, practical gardener to become acquainted wih the results of the latest investigations and researches. This is effected by the " gardening weeks " and gardening courses. The " First Austrian Gardening Week " was held in Vienna from the 9th to the 14th of December 1912. The great interest shown in gardening circles has induced the Council of the Imperial and Royal Horticultural Association to make this gardening week into a permanent institution in the capitals of the different States of the Empire.

In the opinion of the writer, the foundation of half-yearly winter schools (with whole day attendance) would offer a second opportunity to young gardeners for the prosecution of their studies. These, however, would only be established in gardening centres where special crops are cultivated.

Landscape gardeners and head-gardeners receive suitable instruction in Horticultural Colleges (" höhere Gartenbauschule "). As the necessary entrance certificate of one year's practical work by no means ensures that the candidate possesses the required practical experience, the writer thinks it would be advisable that the curriculum of the gardening school should include a year's practical preliminary course, and that the instruction given during the last years should be specialized. It would also be very advantageous if a large market garden were attached to such a school where the student could also be instructed in the commercial side of gardening. In the case of the landscape gardeners, it is very useful and even necessary that they should have the opportunity of completing their education by attending a one year's course at the School of Applied Arts. An interval of two years should elapse between leaving the Horticultural College and entering this School.

1233 - **Importance, Scope and Carrying out of Practical Work in Agricultural Schools.** — 1) SCHNEIDER, FRITZ; 2) GROSS, ALOIS; 3) MARESCH, HEINRICH in *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVII, Part 1-2, pp. 28-33. Vienna, 1913.

The writers deal with the following points:

1. *Practical training in middle agricultural schools.* — *a*) Necessity of practical knowledge for pupils leaving these schools; *b*) advantages and necessity of a preparation on practical lines before admission; *c*) scope and carrying out of practical work in the middle agricultural school at Neutitschein in the three years' course.

2. *Practical training in farm schools.* — *a*) Advantages and necessity of having a farm attached to the school; *b*) scope and carrying out of practical work at the school of agriculture and flax-growing at Mährisch-Schönberg in summer (field work, cultivation and preparation of flax, animal husbandry, dairying, fruit and vegetable growing, forestry) and during the winter (manual work, including wheelwright's work, saddlery and basket work).

3. *Practical work in winter agricultural schools.* — *a*) Manual, including basket work, woodwork and saddlery; *b*) practical work in the school garden and experimental fields.

1234 - **Proposals for the Unification of the System of Instruction in the Lower Agricultural Schools in Austria.** — JACHIMOWICZ, FRANZ in *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVII, Part I-II, pp. 42-54. Vienna, 1913.

The writer complains of the inefficiency and the disadvantages of the existing system of dividing the Agricultural Schools into one-year schools, two-year schools, and winter schools, and proposes that all these different educational establishments should be transformed, according to a single system, into schools with three half-years with an optional (practical) summer half-year, and occasional practical spring and summer courses. He further treats of the division among the teachers of different subjects, the distribution of the subjects over the three half-years and the methods of instruction and examination to be adopted.

1235 - **Agricultural and Forestry Colleges in Prussia during the Summer Half-year of 1913.** — *Zentralblatt der Preussischen Landwirtschafts-Kammern*, Year 12, No. 36, p. 241. Berlin, September 8, 1913.

The agricultural colleges of Prussia were attended during the summer half-year of 1913 by 963 students, of whom 622 continued from preceding half-years. The new students entered were 171 and there were 170 unmatriculated ones.

At the Berlin Agricultural College the students were 500 (78 newly entered and 155 unmatriculated), while the agricultural academy of Bonn-

Poppelsdorf had altogether 493 students (93 newly entered and 15 unmatriculated). As agricultural students, the total entered was 511 (233 at Berlin and 278 at Bonn); 308 were entered as land surveyors and rural engineers (Geodäten und Kulturtechniker), namely 129 at Berlin and 179 at Bonn. In the agricultural technical section (fermentation industries) there were 79 students at Berlin. The lectures at the Berlin college were attended also by 252 students from the Veterinary College, and 113 students from Berlin University followed the common courses of the Agricultural College and of the University.

The Veterinary Colleges were attended by a total of 749 students, of whom 397 entered at the Berlin Veterinary College and 352 at the Hanover Veterinary College. In the first-named there were 310 students from preceding half years, 72 were new and 15 were unmatriculated. In Hanover the corresponding figures were 262, 83 and 7.

The two Forestry Colleges have between them 138 students, namely 60 at Eberswald and 78 at Münden. Of the former 67 are from the preceding courses and 3 newly entered, while the latter has 64 old students, 12 newly entered and 2 unmatriculated.

1236 - **Farm-Management Course at the Agricultural Academy of Bonn-Poppelsdorf.** — *Zentralblatt der Preussischen Landwirtschaftskammern*, Year 12, No. 36; p. 243. Berlin, September 8, 1913.

The agricultural academy of Bonn-Poppelsdorf is starting a course in farm management and cooperation in the winter half-year 1913-14; it covers two halves and leads up to a special examination. It is designed to enable students to acquire a more thorough knowledge of social economy, law and administration, and the theory of cooperation and assurance, as applied to agriculture.

1237 - **Agricultural Shows.**

AGRICULTURAL SHOWS AND CONGRESSES

Argentine Republic.

1913-1914. Dec. 15 - April 15. Córdoba. — Show of fruit and objects connected therewith, bee-keeping, silkworm-rearing and vegetable fibres. Address to the president of the « Comisión organizadora », calle Independencia No 159, Departamento de Agricultura y Ganderia de la Provincia de Córdoba.

Australia: New South Wales.

1914 The following shows will be held:

Jan. 29-31. — Wollongong Agricultural, Horticultural and Industrial Association. — W. J. Cochrane, Sec.
Feb. 4-5. — Berry Agr Assoc. — S. G. Banfield, Sec.
Feb. 10-11. — Dorrigo Agr., Hort. and Ind. Soc. — W. R. Colwell, Sec.
Feb. 11-12. — Moruya Agr. and Pastoral Soc. — H. P. Jeffery, Sec
Feb 11-12. — Alstonville Agr. Soc. — C. D. Mc Intyre, Sec
Feb. 17-19. — Guyra Pastoral, Agr. and Hort. Soc — P. N. Stevenson, Sec.
Feb. 18-19. — Gunning Pastoral, Hort. and Ind. Soc. — J. R. Turner, Sec.
Feb. 24-25. — Dapto Agr. and Hort. Soc. — J. H. Lindsay, Sec.
Feb. 25-27. — Inverell Pastoral and Agr. Assoc. — J. Mc Ilveen, Sec.
March 3-5. — Uralla Agr. Assoc. — H. W. Vincent, Sec.
March 3-5. — Tenterfield Pastoral, Agr. and M. Soc. — F. W. Hoskin, Sec.
March 4-5. — Tumut Agr. and Pastoral Assoc. — T. E. Wilkinson, Sec.

March 5-6. — Oberon Agr., Hort. and Pastoral Assoc. — M. J. Looby, Sec.

March 11-12. — Coramba District Pastoral, Agr. and Hort. Soc. — H. E. Hindmarsh, Sec.

March 11-13. — Tumbarumba and Upper Murray Pastoral and Agr. Assoc. — E. W Figures, Sec.

March 17-18. — Gundagai Pastoral and Agr. Soc. — A. Elworthy, Sec.

March 17-19. — Bangalow Agr. and Ind. Soc. — W. H. Reading, Sec.

March 18-19. — Cobargo Agr., Pastoral and Hort. Soc. — T. Kennelly, Sec.

March 18-20. — Camden Agr., Hort. and Ind. Soc. — C. A. Thompson, Sec.

March 19-21. — Goulburn Agr., Pastoral and Hort. Soc. — G. G. Harris, Sec.

March 24-26. — Mudgee Agr., Pastoral, Hort. and Ind. Assoc. — P. J. Griffin. Sec

March 24-26. — Narrabri Pastoral, Agr. and Hort. Soc. — D. J. Bridge, Sec.

March 25-26. — Blayney Agr. and Pastoral Assoc. — H. R. Woolley, Sec.

March 25-27. — Macleay Agr., Hort. and Ind. Assoc. — E. Weeks, Sec.

March 26-27. — Crookwell Agr., Hort. and Pastoral Assoc. — H. P. Levy, Sec.

March 31 - April 1. — Luddenham Agr. and Hort. Soc. — F. C. Emery, Sec.

April 1-2. — Cooma Pastoral and Hort. Assoc. — C. J. Walmsley, Sec.

April 22-24. — Bathurst Agr., Hort. and Pastoral Assoc. — J. Bain, Sec.

April 22-25. — Hunter River Agr. and Hort. Assoc., West Maitland. — E. H. Fountain, Sec.

April 28-30. — Tamworth Pastoral and Agr. Assoc. — J. R Wood, Sec.

April 29 - May 1. — Orange Pastoral and Agr. Assoc. — W. J. I. Nancarrow, Sec.

May 6-8. — Clarence Pastoral and Agr. Soc., Grafton. — G. N. Small, Sec.

May 7-9. — Hawkesburry District Agr. Assoc., Windsor. — H. S. Johnston, Sec

May 12-13. — Lower Clarence Agr. Soc., Mac Lean. — J. Mc Pherson, Sec.

Belgium.

1913. Dec. 13-15. Jemeppe-sur-Meuse (Liège). — See p. 1354, *B.* Sept. 1913.

1914. Jan. 17-19. Verviers (Liège). — Poultry show, organized by the "Société ornithologique de l'Est de la Belgique".

Feb. 21-24. Brussels. — International poultry show, organized by the "Société Royale des Aviculteurs Belges".

Cuba.

1914. Feb. 15-22. Havana, Quinta de los Molinos. — Poultry show, organized by the "Asociación de Avicultura Cubana".

France.

1913 Dec. Douai (Nord). — National poultry show, organized by the "Club des Aviculteurs et Eleveurs amateurs du Douaisis". Address to E. Mathieu, Gen. Sec., Roost-Warendin, Nord.

Dec. 10-15. Moulins (Allier). — International poultry show, organized by the "Société des Aviculteurs et Apiculteurs du Bourbonnais et du Centre". Address to M. Bruron, 36 rue de Bourgogne, Moulins, or to the general secretary of the society.

Dec. 17. Houdan (Seine-et-Oise). — Seventh show of live fat poultry and dead fat geese. Address to "Siège social du Houdan-Faverolles", 45 Grande-Rue, Houdan

Germany.

1914. Feb. 7-9. Leipzig. — Rabbit show organized by the "Allgemeine Kaninchen-Zucht-Verein für Leipzig und Umgebung."

Oct. 4-5. Hamburg. — Fourth fat stock show, organized by the Chamber of Agriculture of the Province of Schleswig-Holstein. It will include five sections: 1) Live stock (cattle, pigs, sheep); 2) carcases (competition); 3) stock fattened for definite purposes; 4) breeding stock belonging to exhibitors of fat stock; 5) objects and scientific matter concerning the production, trade and utilization of stock slaughtered Address to the offices, Kampfstrasse 46, Hamburg

Hungary

1913 Dec. 5-8. Budapest. — National poultry show organized by the National Society of Poultry Breeders.

Union of South Africa.

1914. Potchefstroom (Transvaal) and Middelburg (Cape). — Trials of tractor ploughs will be arranged by the South African Government.

Feb. 24. Graaf Reinet (Cape). — The Midland Agricultural Society will hold a tractor-ploughing competition in connection with its annual show

March 6 Cradock (Cape). — Field trials for furrow ploughs, organized by the Cradock Agricultural Society. George H Brynes, Sec

1238 - Agricultural Congresses.

Austria.

1913. Dec. 19-20. Vienna. — Fourth meeting and general assembly of the "Oesterreichische Obstbau- und Pomologen-Gesellschaft" (Austrian Fruitgrowers' Association).

United Kingdom.

1914. *Note.* — With reference to the third International Congress of Tropical Agriculture (see *B* Sept. 1913, No. 1238), address to the Organizing Secretaries, Imperial Institute, London S. W.

CROPS AND CULTIVATION.

1239 - Comparative Researches upon the Cohesion of Different Kinds of Soils.

— PUCHNER, H. in *Internationale Mitteilungen für Bodenkunde*, Vol. III, Part 2-3, pp. 141-239 + figs. 2. Berlin, 1913.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

Notwithstanding the importance of the cohesion of the soil for the various operations of tillage, and the researches of Schubler, Haberlandt, Hazard, Atterberg and the writer upon the subject, this property of the soil is the least known and the least investigated.

The writer is of opinion that the best criterium for valuing the cohesion of a soil is afforded by its resistance to crushing pressure, which hitherto had been erroneously thought by agrologists to be absolute. In order to determine this resistance, the writer considers the method proposed by him as the best. It consists in exerting the acquired pressure by means of a lever on cylinders prepared with the fine earth (less than 3 mm. according to Fadejeff) to be examined. These cylinders are 3 cm. high and 2 cm. in diameter. The breaking weight is given in grams. The writer insists upon the essential condition that the structure and composition of these cylinders be as uniform and homogeneous as possible, and of the absolutely cylindrical shape of the sample of earth during the tests.

In this manner the writer has determined the cohesion of 265 samples of soil taken in several parts of Bavaria at varying depths from 0 to 8 inches and from 20 to 40 and 48 inches.

In general, cohesion is found to vary very much; in most cases it is less in the surface layers than in the deeper ones. The following table gives an idea of the various degrees and limits of such variability, in which the several degrees of cohesion determined for the superficial layers or to a depth of about 2ft. 2 in. are grouped together.

Cases	Cohesion according to Puchner, in grams		
22.	over		20 000
30.	10 000	to	20 000
57.	5 000	»	10 000
63.	2 000	»	5 000
34.	500	»	2 000
59.	0	»	500

From the comparative study of the other properties of the soils examined, the writer deduces the eventual influence of mechanical and physical structure, of chemical composition and of biological factors upon the cohesion of soils, reaching the following principal conclusions, taking into account the fact that the determinations of cohesion were made on perfectly dry material.

I. The cohesion of a soil, other conditions being equal, probably increases the less sand (from 0.25 to 3 mm.) is contained in the fine earth and the more uniformily the other parts (from less than 0.0015 to 0.25 mm.) are mixed together in equal proportions.

II. The cohesion of a soil may also vary not only according to the physical properties of its constituent parts, but also according to chemical and biological conditions.

As for the application of these results to practical work, the writer has pointed out that in stiff soils cohesion diminishes gradually with an increase of moisture, whilst with loose soils the reverse takes place, with this difference: that coarse-grained loose soils show cohesion only with a maximum of moisture, whilst in those possessing a fine texture cohesion increases with moisture up to a certain point and then diminishes. Consequently the cohesion indices obtained as above must be increased when they are low, and diminished when they are high, in order to get data for judging soils naturally moist.

The resistance of the soil at a given degree of moisture remains to be determined. The writer remarks that though the farmer is anxious to till the soil when it is easiest to work, that is, most frequently, when moderately moist, nevertheless a closer knowledge of the factors determining cohesion may lead to the discovery of other means of reducing the cohesion of a soil in medium conditions of moisture and thus rendering it easier to work.

1240 - **The Bacterial Activity of the Soil in Relation to some of its Physical Properties.** - 1. RAHN, O (Agricultural Experiment Station, East Lansing, Michigan) Die Bakterientatigkeit im Boden als Funktion von Korngrosse und Wassergehalt. — *Centralblatt fur Bakteriologie, Parasitenkunde und Infektionskrankheiten, II Abt.*, Vol 35, No 17-19 pp. 429-465 + fig. 1. Jena, October 30, 1912 — 2. ID (Bacteriological Laboratory of the University of Wisconsin). Die Bakterientatigkeit im Boden als Funktion der Nahrungskonzentration und der unloslichen organischen Substanz — *Ibid*, Vol 38, No 19-20, pp 484-494 Jena, August 9, 1913

In order to determine the influence of the physical properties of the soil on bacterial activity pure cultures of *Bacillus mycoides* and other aerobic bacteria were grown in a mixture of quartz sand, peptone and water, and in a parallel series of mixtures containing cellulose. The production of ammonia was taken as the index of bacterial activity. For studying anaerobic bacteria comparative cultures of *Bacillus lactis acidi* were made in mixtures of milk and sand and their activity measured by the quantity of acid and by bacterial counts.

The conclusions vary according to the method of comparison adopted. Estimated in percentages of dry soil, as is custumary in soil bacteriology, it would appear that the bacteria develop more readily in sand moderately damp (20 to 25 per cent. water); but estimated in terms of the peptone solution, ammonification is more rapid in a medium containing only 10 per cent. of water. Thus the results vary considerably according to whether the proportion of peptone is calculated in terms of soil or solution in water. Since the agriculturist is concerned only with the quantity of available nutritive substances present in the soil, it is necessary to determine the intensity of bacterial activity by comparing cultures equal in quantity and strength of nutritive substances.

In culture of *B. mycoides* the exchange of oxygen is considerably greater and the growth of bacteria more rapid in sand cultures than in cultures prepared in tubes or flasks. The exchange of oxygen between the soil gases and the liquid depends upon the amount of oxygen present in the soil gases and the surface exposed to the air. The surface area per unit of liquid is in inverse proportion to the square of the diameter of the soil particles and to the amount of liquid in the soil. The amount of oxygen in the air of the soil depends upon the aeration, which is almost proportional to the square of the diameter of the particles. The rate of decomposition is proportional to the thinness of the film of moisture up to a certain limit, extremely attenuated films retarding decomposition. The optimum thickness of water films for *B. mycoides* is about 20 to 40 μ. This thickness was obtained by using sand of 1 mm. diameter with humidity of 10 per cent. In arable soils in which the diameter of the particles does net exceed 0.1 mm., a humidity of 50 per cent. is necessary in order to obtain the thickest film; so that aerobic bacteria will never find the best condition of growth in ordinary soils.

Provided that the concentration of the nutritive substance is constant, the end of the decomposition in the case of *B. mycoides* is always the same, since only the rate of decomposition is modified by the supply of oxygen. With other bacteria this limit varies considerably.

Anaerobic bacteria, such as *B. lactis acidi*, follow the same principles; that is to say their growth depends chiefly on the thickness of the film of water.

Lastly, the physical effect of undecomposed organic matter was obtained by adding filter paper or peaty matter. In fairly dry media or soils, cellulose causes a decrease in the formation of ammonia owing to the withdrawal of some of the available moisture. In moist sand cultures, on the contrary, the addition of cellulose increases ammonification, probably owing to the separation of the particles and the increase in aeration.

1241 – **The Reawakening of the Soil.** MUNTZ, A. and GAUDECHON, H. in *Annales de la Science Agronomique*, Year 30, No. 1, pp. 1-15. Paris, July 1913.

The sudden outburst of life in the soil which occurs at the end of the winter with the first rise of temperature is a well-marked phenomenon and the writers have already alluded to it as the " reawakening of the soil." It would naturally be expected that this process should be connected with an increased biological activity, of which the production of nitrates is one of the most palpable and characteristic effects; the writers had grounds for believing that the nitrifying organisms, at that period of the year, go through a phase of intense activity which declines after a short time, and is due not simply to the rise in temperature, but rather to a predilection for a definite period of the year, to a kind of racial habit; to investigate this question they undertook the following set of experiments.

In 1910, during the period from February to June samples of soil were taken at fornightly intervals, their nitrate content was determined, and they were seeded into pots of soil (sterilized at 100° C.) and of leaf mould (sterilized in an autoclave at 100 - 102° C. for 3 hrs.). The pots contained 1.1 kg. of soil, or 375 gms. of leaf mould, to which had been added 0.2 per cent. and 0.3 per cent. respectively of ammonium sulphate; after being inoculated with 20 gms. of the " active " soil, they were incubated at 23° C., and their moisture content was kept constant by the addition of sterilized water. Their contents were sampled once a fortnight and analysed for nitrates, and the inactivity of the uninoculated sterilized soil and leaf mould was checked by one pot of each material which received no " active " soil and in which the nitrate content was practically constant throughout the experiments. The samples of the " culture " soil were drawn from a piece of open ground covered over with a large tin basin to prevent washing by rain.

In 1911 a second series of experiments was carried out under similar conditions, except that the " active " soil samples were drawn from a block of soil of 7 kg., which was taken from the field in the early part of February and subsequently kept at a constant temperature of from 0° to 2° C.; and further that each time the pots were sampled, sufficient ammonium sulphate was added to bring their content up to 0.2 per cent. or 0.3 per cent. again as the case might be.

The data of the samples used and the results of the two seasons are shown in the accompanying tables.

"Active" soil samples.

1910			1911		
Date of sampling	Temp. of soil 4 in deep.	Nitrates: Nitrogen in mgm. per kg. of dry soil	Date of sampling	Temp. of soil.	Nitrates: Nitrogen in mgm. per kg. of dry soil.
Feb. 18 . . .	4°C	3.8	Feb. 14 . . .	0° — 2C	12
March. 3 . . .	5°C	6.0	» 28 . . .	»	12
» 18 . . .	7°C	6.2	March 14 . . .	»	15
April 2 . . .	12°C	6.2	» 28 . . .	»	14
» 18 . . .	9°C	6.2	April 11 . . .	»	15
May 2 . . .	10°C	12.5	» 25 . . .	»	13
» 17 . . .	16°C	12.0	May 9 . . .	»	22
June 6 . . .	20°C	12.5	» 23 . . .	»	17
» 13 . . .	16°C	12.0			

Soil or leaf mould from pots.

Date of Inoculation	Nitrates (as Nitrogen in mgm. per kg. dry soil) formed			
	In soil		In leaf mould	
	during 2nd fortnight after inoculation	during 3rd fortnight after inoculation	during 2nd fortnight after inoculation	during 3rd fortnight after inoculation
1910.				
Feb. 8	9	40	129	—
March 3	158	249	236	—
» 18	300	294	381	—
April 2	108	333	416	—
» 18	208	191	454	—
May 2	206	141	125	—
» 17	—	—	58	—
1911.				
Feb. 14	144	128	129	1 052
» 28	64	251	355	959
March 14	50	420	707	1 820
» 28	291	243	1 704	234
April 11	406	196	701	353
» 25	388	92	454	315
May 9	265	179	270	1 242
» 23	253	325	1 019	937

In the soil the formation of nitrates is not so rapid as in the leaf mould, so that in the former medium the 3rd fortnight after inoculation forms the best period of comparison, while in the leaf mould nitrification is already sufficiently active during the 2nd fortnight. In both years and in both media there was demonstrated a period of maximum activity for the nitrifying organisms corresponding to the time when the so-called reawakening of the soil occurs in the district (Paris). The activity could not be attributed to variation in temperature, as the pots of soil and of leaf mould were all maintained at a constant temperature, and as during the second year this factor was also eliminated from the soil used for inoculation. The period of maximum activity was followed by a period of reduced nitrate formation which persisted a certain length of time, and though later the fermentation again increased, it never became as intense as during the first outburst in the early spring.

1242 – **Studies in Bacteriological Analysis of Indian Soils: No. 1, 1910-1911.** — HUTCHINSON, C M (Imperial Agricultural Bacteriologist, Pusa). — *Memoirs of the Department of Agriculture in India, Bacteriological Series*, Vol I, No. 1, pp. 65, figs. 2, plates VI, diagr II. Calcutta, November 1912.

The writer has made thorough preliminary investigations into the bacteriology of certain Indian soils. A large part of the present paper is occupied with a discussion of comparative experiments on the methods to be used in estimating the numbers of bacteria present and their activity, especially in the changes of nitrogen under various conditions.

In an investigation of the so-called " weathering " of soils by repeated ploughing in the hot dry season preceding the spring rains, it was found that the maximum temperature reached by the top quarter inch was 60° C. Artificial weathering was therefore effected by exposing soil to the heat and light of a Nernst lamp for 8 hours daily for a week at such a distance that the maximum temperature at the surface was 60° C. The results showed that the number of bacteria was considerably reduced and that all but the sporing forms of the *subtilis* group (*B. mycoides*, *B. subtilis*, *B. mesentericus*) were eliminated from the first inch of soil. It was found that the nitrifying power of the soil was not destroyed or altered by " weathering ", which the writer explains as due to reinfection of the surface soil from the lower layers.

The soils were further examined for the presence of protozoa by seeding into hay infusion ; two types of protozoa occurred (together in some cases) ; none were found between November and May. These two types were destroyed at 60° C. but not at 55° C. As, however, they were found in a Pusa soil in May, just after the "weathering" operation had taken place, it does not seem likely that the effectiveness of this operation can depend on their elimination.

Experiments on the effect of various forms of partial steilrization on anaerobic and aerobic bacteria showed that in general the former suffered more severely than the latter. Artificial "weathering" at 55° C. for 14 days eliminated all anaerobic organisms capable of developing on agar plates.

In conclusion, the writer suggests that an important result of weathering, in which the top 9 inches of soil become practically air-dry, may be to stop bacterial action and so conserve unchanged the organic matter which has not been previously decomposed ; in other words, it would form a method of avoiding too rapid decomposition of organic manures, an effect which may be valuable under the high temperatures prevailing in India.

MANURES AND MANURING

1243 - **The Injurious Effects of Large Doses of Lime on Moor Soils.** — DENSCH, A. in *Mitteilungen uber die Arbeiten der Moor Versuchs-Station in Bremen*, Fifth Report, pp. 331-352. Berlin, 1913 (1)

One of the fundamental measures adopted in the improvement of moors is liming ; it has, however, frequently been observed that excessive applications of lime are injurious, so that now not more than 1800 lbs. per acre are given to arable land, whilst pastures and meadows, being less susceptible, may be given 3600 to 4000 lbs. per acre (2).

The causes of this injurious effect are not yet well known. The writer has especially studied, in a series of laboratory researches, the behaviour of nitrogenous compounds in similar conditions, and has arrived at the following conclusions :

I. The cause of the injury due to heavy liming on moor soil is connected with the nitrogen question.

II. The transformations of nitrogen in moor soils are essentially chemical, but a concurring bacterial activity is not out of the question.

III. In such moor soils, both limed and unlimed, losses of nitrogen, after a dressing with nitrate, are observed. On the intensity of such loss lime does not appear to exert a determined influence ; these losses lower the utilization of the nitrogen but do not cause an absolute deficiency of this element

IV. Under certain conditions an active leaching out of nitrate from peaty soils that have been limed may cause considerable losses, which, however, are limited to cases of exceedingly unfavourable weather.

V. In decomposing moor soil nitrate undergoes a partial reduction to ammonia and this to a great extent when the soil has been heavily limed. As intermediate product nitrous acid may be formed, this, however, may remain a fair length of time in the soil.

VI. It is highly probable that this formation of nitrites is one of the concurring causes of the injurious effects hitherto observed , of course without excluding other possible factors.

VII. Besides the nitrites, probably some nitro or nitroso compounds are formed, and it is not impossible that they also may be injurious to plants.

Lastly, in order to avoid the reduction of nitric nitrogen an energetic tiling of the soil is recommended, so as to favour an active oxidation of the nitrogen compounds.

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(1) See No 345, *B.* April 1913. (*Ed.*)

(2) See above: BERSCH, « Moor Cultivation in Austria » p 1675

1244 - **The Residual Nitrogen from Green Manure in Sandy Soil as determined by Vegetation Experiments.** — VON SEELHORST, C. etc. — *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Part 241, pp. 147 + 19 diagrams. Berl'n, 1913.

Practical experience has shown that, in sandy soils, the nitrogen introduced with green manures, though often considerable in amount, appears to remain wholly, or nearly wholly, unutilized.

This may be due to:

a) leaching;

b) losses due to denitrification and the liberation of ammonia into the air;

c) the solubility of organic residues;

d) the fixation of nitrogen in an albuminoid form. The last cause must, by the fact of the scanty utilization itself, be excluded; there then remain the three other causes, which have been the object of the experiments discussed.

These experiments were carried out in boxes 10 feet square and 4 ft. 6 in. in height. They were filled with heath-sand, resting upon a layer of pebbles and river-sand, and covered by a little heath-humus; a total of 4349 lbs. of dry substance with about 1.17 lb. of nitrogen. The final scheme of the experiments is given in Table I.

The manure consisted of 40 gms. of 40 per cent. potash salts and 40 gms. of superphosphate per box, except in the case of No. 14; all the boxes were inoculated with lupin-soil.

The final balance of nitrogen is shown by Table II.

These complete data, which confirm the partial data, permit of some statements of general practical importance being made.

The amount of nitrogen yielded by the boxes planted with cereals is less than that yielded by the boxes planted with potatoes; on the other hand, the nitrogen content of the cereal crops is greater than that of the tubers, the difference being due to the fact that the boxes containing the potatoes lose more water by drainage than those planted with cereals. Further, the utilisation of nitrogen was minimum when the green manure was applied early, while it was perceptible when this was dug in late. In calculating the utilization of nitrate of soda per year and acre, and taking it on an average as 55 per cent., we have for boxes 1, 7, 2 and 8, the following figures respectively: 1.7, 1.6, 2.2 and 2.4 gms.

Most of the unused nitrogen is thus carried off by the drainage water; leaching is less in the case of cultures of cereals than in those of potatoes, which proves that the latter require less water, and therefore more water drains off; nevertheless, in the case of late potatoes, the loss can be modified. In all cases, the losses by drainage were larger with autumn green manure than with that spread in the spring; this was especially true for potatoes, for during the slow developement of the latter, the green manure retained, together with the nitrogen, a considerable amount of water. Thus the nitrogen content of the crops was always larger with spring than with autumn green manure. As a rule, the late use of green manure is of distinct advantage, especially for hoed crops.

TABLE I.

Years	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1904–07	Green manure of blue lupins (1907 peas)												1904 Barley	1904 Fallow
	Dug in deep						Dug in superficially							
	Spring		Autumn				Spring		Autumn					
1905–08	Potatoes	Barley	Potatoes	Barley	Potatoes	Rye	Potatoes	Barley	Potatoes	Rye	Potatoes	Rye	Rye	Fallow
1908–09	Rye													Fallow
1909–10	Italian Rye Grass													Fallow
1910	Buckwheat													Fallow

TABLE II. — *Balance of nitrogen.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nitrogen of the crops:														
1904-07 . . . . gm.	17.966	18.835	10.413	10.408	9.282	9.371	17.794	19.292	10.063	10.964	9.089	10.683	9.452	—
1908-10 . . . . »	6.727	8.563	5.985	7.233	6.415	6.374	6.694	9.556	6.995	7.460	5.837	7.528	5.472	—
Total . . gm.	24.693	27.398	16.398	17.641	15.697	15.745	24.488	28.848	17.058	18.424	14,926	18.211	14.924	—
Nitrogen of the drainage water:														
1904-07 . . . . gm.	20.169	13.573	35.350	25.799	34.544	26.428	21.702	13.608	34.791	23 930	33.039	24.051	9.040	22.397
1908-10 . . . . »	8.687	8.860	7.696	6.525	7.959	8.505	9.610	8.083	8.740	6.978	7.775	6.772	3.534	5.505
Total . . gm.	28.856	22.433	43.046	32.324	42.503	34.933	31.312	21.691	43.531	30.908	40.814	30.823	12.574	27.902
Total nitrogen of crops and of drainage water. gm.	53.549	49.831	59.444	49.965	58.200	50.678	55.800	50.539	60.589	49.332	55.740	49.034	27.498	27.902
Nitrogen of green manure »	49.762	54.840	41.308	42.732	40.341	35.169	53.259	55.150	42.175	36 088	37.110	35.961	—	—
Residuum, October 1, 1910 gm.	— 3.787	+ 5.009	— 18.136	— 7.233	— 17.359	— 15.509	— 2.541	+ 4.611	— 18.414	— 13.244	— 18.630	— 13 078	— 27.498	— 27.902

TABLE III. — *Amount of drainage water*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1904-07 . . . . kg.	823.2	636.0	970.9	860.5	1 006.1	859.9	820.0	660.1	965.9	860.2	1 054.8	867.7	1 120.6	1 287.3
1908-10 . . . . »	680 4	653.8	698.2	669.3	712.8	682.5	716.8	620.2	683.7	712.1	702.2	666.7	657.0	752.2
Totale . . . kg.	1 503.6	1 289.8	1 669 1	1 529.8	1 718.9	1 542.4	1 536.8	1 280.3	1 649.6	1 572.3	1 757.0	1 534.4	1 777.6	2 039.5

It should be noted that in the cases of box No. 13, which was continuously cultivated without green manure, and of No 14, which lay fallow, the amount of nitrogen yielded was about the same ($^5/_9$ being in the crop and $^4/_9$ in the drainage water in the former case, and the whole in the drainage water in the latter case). This is the best proof of the importance of always keeping light soils in cultivation. The after-effects of the green manure were very different in the boxes planted with potatoes and in those in which cereals were grown. These differences did not appear in the loss of nitrogen by drainage, but were noticeable in the nitrogen content of the subsequent crop, which was larger in the plants grown after cereals, the increase being attributable to the action of the stubble. Further, when it is stated that the differences in the residues at the close of the experiment were much greater than those of the after-effects, it must be considered that the nitrogen residue is not present in the soil, and that the nitrogen which is not utilised by the crops, and not lost in the drainage water, becomes denitrified, while the after-effects are due to the stubble. On the contrary, no decisive after-effect of the green manure can be attributed to its having been dug in deeply or superficially, except perhaps as regards cereals in the second case.

The favourable after-effects of the stubble are, on the contrary, evident and must be attributed, not only to the fact that it retains some of the nitrogen by checking leaching, but also to the useful action of its decomposition products upon the activity of nitrogen-fixing bacteria. It cannot otherwise be explained how, with a greater initial deficit in nitrogen, boxes 6,10 and 12, which were planted with cereals, yielded in 1910 a larger amount of nitrogen than boxes 1 and 7, in which potatoes were grown.

1245 - **General Situation of Nitrate of Soda at the End of the First Half-year 1913.** — BROWNE, A. G. (Gerente interno) in *Asociación salitrera de Propaganda Circular Trimestral*, No 60, pp. I-LV. Iquique, August 1, 1913.

According to the last report of the managers of the "Asociación Salitrera de Propaganda" the situation of nitrate of soda in the whole world on June 30, 1913, was the following:

Production. — The data supplied by the establishments for the first half-year 1913 and the effective figures for the "nitrate" year, from July 1, 1912, to June 30, 1913, compared with those of the preceding year, are the following: (1).

1st half-year 1913	1st half-year 1912	Difference	« Nitrate » year 1912-13	« Nitrate » year 1911-12	Difference
tons	tons	tons	tons	tons	tons
1 354 175	1 208 540	+ 145 635	2 619 898	2 399 604	+ 220 294

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(1) See No. 785, *B.* July 1913. (*Ed.*).

Exportation. — For the same periods of time it was:

1st half-year 1913	1st half-year 1912	Difference	« Nitrate » year 1912-13	« Nitrate » year 1911-12	Difference
tons	tons	tons	tons	tons	tons
1 211 491	1 018 219	193 272	2 632 157	2 441 451	190 706

Consumption. — The amounts consumed during the same periods were as follows:

1st half-year 1913	1st half-year 1912	Difference	« Nitrate » year 1912-13	« Nitrate » year 1911-12	Difference
1 727 536	1 729 450	1 914	2 472 640	2 384 344	88 296

Summing up, the general situation from July 1, 1912, to June 30, 1913, was the following:

I.	Stock existing on June 30, 1912 . .	tons	616 289
II.	Actual production from July 1, 1912, to June 30, 1913.	»	2 619 898
		»	3 236 187
III.	Shipped, July 1, 1912 to June 30, 1913	»	2 632 157
IV.	Existing on June 30, 1913	»	604 030

Forecasts. — The following is a comparison between the forecasts for the nitrate year 1912-13 and the actual data:

Forecasted production	2 675 271	tons
Actual production	2 619 898	»
Difference	55 373	tons

Thus the forecast exceeded by 2.11 per cent. the actual output.

The production for the calendar year 1913 is expected to be about 2 717 000 tons, taking into account the fact that the effective output for the first half-year of 1913 attains almost one-half of the above figure.

This of course always assumes production to be free, for it might be modified if the law on the limitation of the production of nitrate in Chile were to come into force.

Market conditions. — The consumption of nitrate of soda by Europe and Egypt has not agreed with the previsions; whilst in 1912 there was an increase of 150 000 tons, in the first half of this year a decrease of 112 260 tons took place This is attributed partly to commercial causes and partly to the favourable condition of the cereals in the spring

In the United States on the contrary, consumption during the same period increased to such an extent as to counterbalance the diminution in Europe, and to avoid carrying over into the new season an excess of stock. The development of imports of nitrate into the United States is remarkable; in the month of May it reached 87 976 tons, the largest quantity hitherto imported.

Summing up, the total consumption of nitrate of soda in the "nitrate" year 1912-13 has exceeded that of the previous year by 90 000 tons; this increase was, however, limited by the shortage of nitrate available for the market and is 135 000 tons below the corresponding effective production.

1246 - **The Development of the Phosphate Industry in Egypt** (1). — *The Board of Trade Journal*, Vol. LXXXII, No. 875, p. 587. London, September 4, 1913

According to a report issued by the Survey Department of the Egyptian Ministry of Finance, the existence of phosphates in Egypt was first shown by the Geological Survey in 1900 The exploitation of the deposits, however, was not commenced till 1908, and the rapid growth of the output of phosphates since then is shown by the following table.

	tons		tons
1908	700	1911	6 425
1909	1 000	1912	69 958
1910	2 397		

Now that some of the mines are connected by rail with the coast, the out-turn of phosphates is increasing rapidly.

As there is no factory in Egypt for the manufacture of superphosphates, and as the local demand for phosphates as manure is at present negligible, practically the whole of the phosphates mined is at present exported. There are many low-grade deposits, however, which may in time become of commercial value if a demand should arise for raw phosphate as a manure.

1247 - **Relative Composition of Different Samples of Basic Slag.** — Rousseaux, E. and Joret, G. (Yonne Agricultural Station). Composition comparée des scories de déphosphoration quant à leur teneur en acide phosphorique et en chaux — *Bulletin mensuel de l'Office de renseignements agricoles*, Year XII, No. 8, pp 957-959 Paris, August 1913.

The writers found that local farmers prefer to use basic slag of low phosphoric acid content (8 to 10 per cent.), believing that the deficiency of phosphoric acid is compensated for by the higher percentage of lime. Several different slags were analysed by the writers with the following results:

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(1) See No. 21, *B*: Jan. 1913 (*Ed.*).

	Phosphoric acid — %	Lime — %
Slags of poor quality:		
1	10.00	51.50
2	10.04	35.64
Slags of medium quality:		
1	15.88	51.50
2	15.50	35.00
Slags of high quality:		
1	17.60	50.84
2	17.60	43.77
3	18.22	52.75
4	18.88	41.45

These results show that slags of the same phosphoric acid content contain very varying proportions of lime, and that those with high phosphate content are not always the poorest in lime.

It follows that there is no relation between the proportions of phosphoric acid and of lime in slag, since its total chemical composition, depending on the materials from which it is produced, is very variable.

There is, therefore, no justification of the farmers' preference for a slag of low quality.

1248 - **Potash Deposits in India.** - HAYDEN, H. H. General Report of the Geological Survey of India for the Year 1912, Potash Salts, in *Records of the Geological Survey of India*, Vol. XLIII, Part I, pp. 20-21. Calcutta, 1913.

Potash salts have been found in the salt mines at Khewra and Nurpur (Salt Range, Jhelma, Punjab) by Dr. W. A. K. Christie, but owing to the deposits being overlain by seams of unsaleable marl which do not concern the mining authorities, their investigation is difficult. The principal potash-bearing bed found in the Pharwala section of the Mayo Mine was traced at various points for some 850 feet along its strike and over 250 with the dip, which is about N. 30° W., with an inclination of 20 to 50°. Its average thickness is six feet, and the potash content varies from 6.8 to 9.6 per cent. of K_2O. The distances given are indications of the comparatively extensive nature of the deposit, but they are not intended as a basis for calculation of the material available for extraction, as questions of expediency in pillar preservation complicate the issue.

Another seam eight feet thick and carrying 7.7 per cent. of K_2O was found in a prospecting drift in the Pharwala salt; what was presumably the same bed was struck in another prospecting drift 700 feet to the E. N. E.

In the Buggy section of the Mayo mine the only seam of any importance that was found was traced for about 150 feet along its strike, which is E. N. E. - W. S. W. The dip of the bed is about 35°, its average thickness two feet nine inches, and it carries 14.4 per cent. of K_2O. The seam thins out when followed upwards along the bedding: in another chamber, at a distance of 170 feet south from the nearest exposure, it was found to be only a few inches thick.

The seam in the Nurpur mine is exposed only in one place which is difficult of access. It dips S S E at about 75° and at this point is six feet thick. A typical specimen from this deposit carried 14.1 per cent of K_2O.

The potassium - bearing minerals of the salt formation are chiefly langbeinite and sylvin; kainite and blödite with a small percentage of potassium are often present in small quantities. The deposits are usually fine-grained mixtures of these minerals with common salt and kieserite. The economic bearing of the occurrences, together with questions of their mineralogy and genesis, will be discussed in a paper now in preparation.

1249 - The Decomposition of Feldspar and its Use in the Fixation of Atmospheric Nitrogen.

— Ross, W. H. (Scientist in Soil Laboratory Investigations, Bureau of Soils U. S. Dept. Agr.) in *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 9, pp. 725-729. Easton, Pa., September 1913.

The extensive search for sources of potash salts which has been undertaken in the United States during the past two years has naturally led to renewed efforts in devising methods for its extraction from feldspar and other silicates (1). The total number of patents which are concerned in the extraction of potash from silicates is at least 40; the various processes may be considered in three groups as follows: 1) Processes which yield potash as the only product of value; 2) processes which yield potash, and some other saleable material as a by product; 3) processes in which two or more operations are combined in one, yielding a fertilizer containing two or more of the essential plant foods (potash, phosphates and nitrogen) in available form.

Of the 40 patents which have been referred to, about half make no reference to any products of value which can be recovered other than the potash. From the results previously obtained, it is safe to conclude that the value of the product could not cover the cost of the operation.

Most of the others refer to the second group, and among the various by-products which are considered possible of recovery are: alumina, silica, pigments, raw materials for the manufacture of glass, and hydraulic cement. Some of these processes are being carried out on a relatively large scale, but no conclusive data have yet been obtained.

With regard to the third group, there is the old process of Charles Bickel. This consists in the treatment of feldspar with phosphate of lime and air-slaked lime, in oder to obtain both the potash and the phosphate in a soluble condition. It was however found, on investigation, that much potash was lost and that only 40 per cent. of the phosphoric acid was rendered citrate-soluble. A better result was obtained by adding to the mixture a little hematite and manganese dioxide and igniting the whole to about 1400° C. All the potash and phosphoric acid were thus obtained in a citrate-soluble condition.

The writer's object in the present investigation was to test the efficiency of ignited feldspar in bringing about the fixation of nitrogen, while there was the possibility of liberating potash at the same time.

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(1) See No. 1613, *B*. Dec 1912. (*Ed*.).

The various processes for the fixation of nitrogen may be divided into four groups according to the products obtained, *viz.*:

a) Nitrates or nitrites.
b) Ammonia.
c) Nitrides.
d) Cyanides, or related compounds, as cyanamide.

The processes of the third group are based on the property possessed by some metals of fixing nitrogen with the formation of nitrides; it has been found that, instead of using the metal directly, a mixture of the oxide and carbon may be employed. The most noteworthy experiments in this direction have been made by Serpek ; in these nitrogen was fixed on a large scale with the formation of aluminium nitride by igniting bauxite (aluminium oxide) with carbon at 1800 - 2000° C.

The writer in his own experiments used a feldspar of the following composition :

Silica	64.32 %
Alumina	19.64 »
Ferric oxide	trace
Lime	0.16 »
Magnesia	0.08 »
Potash	13.72
Soda	2.18 »

The principal results of the experiment were as follows:

No. of experiment	Feldspar — gms.	Carbon — gms.	Calcium carbonate — gms.	Temperature of ignition — C.	Potash volatilized in percentage of total present	Nitrogen fixed %	
						of feldspar	of aluminium in feldspar
1	4	2	0.0	about 1200°	5.0	0.20	1.9
2	6	3	6.4	» »	—	0.83	8.0
3	4	2	4.3	»	55.7	1.27	12.2
4	2	1	2.15	»	—	1.44	13.8
5	4	4	4.3	»	—	1.40	13.4
6	2	4	2.15	» »	38.0	1.45	13.9
7	4	2	2.15	» »	—	0.50	4.8
8	4	2	12.0	» »	78.0	0.44	4.2
9	4	2	0.0	» 1400°	41.3	1.00	9.6
10	4	2	2.15	» »	98.0	1.68	16.1
11	4	2	4.3	» »	100.0	6.10	58.5
12	2	4	6.0	» »	100.0	5.21	50.6

The increase of fixation with time of ignition is shown in the following table (referring to the experiments 3 and 11):

Time of ignition — hours	Temperature C	Potash volatilized in % of total	Nitrogen fixed in %	
			of feldspar	of aluminium in feldspar
1	about 1200°	55.7	1.27	12.2
2		68.9	1.34	12.9
4		83.0	1.68	16.1
1	1400°	100.0	6.10	58.5
2		100.0	7.44	71.5

Since the nitrogen in aluminium nitride amounts to 51.6 per cent. of the aluminium, it follows that the nitrogen fixed in the last two experiments is combined in a form that has, so far, not been determined. When boiled with water the material gave off ammonia very slowly, though the ammonia was evolved more rapidly when sodium hydroxide was used.

Equipment is now being installed to carry on the experiments on a larger scale and at higher temperatures. In the meantime it was thought advisable to publish the preliminary results obtained.

1250 – **The Consumption of Chemical Manures in the German Colonies.** — HILLMANN Wanderversammlung Strassburg 1913. Kolonial-Abteilung, Geschaftsbericht fur das Jahr 1912 — *Jahrbuch der Deutschen Landwirtschafts Gesellschaft*, Vol. 28, Part 2, pp 429-430 Berlin, September 1, 1913.

An interesting index of the incipient development of the consumption of chemical manures in the German Colonies is afforded by the orders which were received by the Fertilizer Section of the German Agricultural Society. The quantities, in hundredweights, are given in the following table:

Thus, in 1912 a total of 39235 cwt, of chemical manures was sent to the colonies by the German Agricultural Society.

	Superphosphates	Double superphosphates	Basic slag	Peruvian guano	Crude phosphate	Bone meal	Chloride of potash	Sulphate of potash	Kainite	Potash manures	Potassic magnesian salts	Nitrate of soda	Sulphate of ammonia	Cyanamide	Nitrate of lime	Lime and marl
The Planters' Association at Toyo	2	177	197				256		8	—		2	51	—		
Id. in Kamerun	13	4 6[illegible]3	4 679	—	4 279	10	5 805	2 943	1 065	37	—	5	4 9[illegible]5	1		5 26
Id. in East Africa		655	8	—	6		[illegible]92		—	—		—	718		2	—
Id. in New Guinea .	—	481	23[illegible]	—	—	—	[illegible]50	295	148	—	118	—	453	—		—
Id. in the Pacific		136		—	—		124	—		—	—		1 [illegible]6	—		
Exports to S W Africa . .	—		10	10	—	20	—			10	—	5	—	—	1	—
Total . .	4	6 105	5 13[illegible]	10	4 285	32	7 127	3 238	1 221	47	118	12	[illegible] 58[illegible]	1	2	5 26

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS

1251 – **Influence of the Partial Suppression of Food Reserve in the Grain on the Anatomy of Plants.** — DELASSUS, M. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol 157, No 3, pp 228-230 Paris, July 21, 1913

The writer operated on the seeds of *Faba vulgaris*, *Lupinus albus*, *Vicia sativa*, *Cicer arietinum* and *Cucurbita pepo*, removing half the cotyledons; he then germinated the seeds, and compared the plants thus obtained with others grown from normal unmutilated seeds. In a previous investigation he recorded effects on the external morphology and general development of the plants, and in the present paper he shows how their anatomy was influenced. The total volume and the surface of the plants from mutilated seeds were considerably reduced, as were all the tissues, especially the fibrous and secondary tissues, whose differentiation was retarded; the number of vascular bundles was also diminished.

PLANT BREEDING

1252 – **Research on the Variability of the Sexes in *Cannabis sativa* L. and *Rumex Acetosa* L.** — SPRECHER, A in *Annales des Sciences Naturelles, Botanique*, Vol XVII, No 5 6, pp 254 352 Paris July 1913

Plants of *Cannabis sativa* and *Rumex Acetosa* were grown in 1909 on 8 plots, each of which received a different manurial treatment, in order to determine whether the proportion in which the sexes appeared was affected by the modified food supply. Further, the seed was sorted out into classes according to colour, size and germination energy in the case of *Cannabis sativa* and according to size only in the case of *Rumex Acetosa*, each class being sown on a subdivision of the manurial plot in order to determine whether a correlation could be established between the sex of the plant and the external characteristics of its seed. Out of a total of 38 400 *Cannabis sativa* seeds sown, 23 769 adult plants were obtained, but the following year, when the experiment was repeated with slight modifications, an unfavourable season caused only 4280 plants to survive out of 28 800 seeds sown. *Rumex Acetosa*, being a perennial, flowered the second year only, when a total of 6049 individuals was available for discussion.

The writer reviews the results obtained by other investigators on the same subject, and treats his own results according to the statistical methods of Davenport and Johannsen, from which he concludes that manuring has no modifying influence on the proportions of the sexes, and that the sex of the plants cannot be predicted from the external characters of the seeds which he investigated (colour, markings, size and weight). The proportion of sexes, though constant for each variety, differed considerably between the two plants considered, being 100 males : 112 females for *Cannabis sativa*, and 100 males : 204 females for *Rumex Acetosa*.

A large number of adult plants were measured and weighed to study the question of sexual dimorphism. It was found that in the case of *Cannabis sativa* the males were taller than the females, being as 120:100 at the flowering stage and 113:100 later on, but on the other hand the females were heavier than the males (130 : 100). In the case of *Rumex Acetosa* the females were taller than the males (122:100).

Lastly, sap was extracted from a number of male and female plants of the same age and its osmotic pressure was determined as a means of measuring its concentration. The pressure, though very variable, was almost always higher in male plants than in females, and the difference appeared to be due to the organic material rather than to the inorganic salts, and to be attributable rather to a different stage of development of the plants than to inherent differences between the two sexes; or, in other words, the studies indicated that male and female plants do not mature their sexual organs at the same stage of development.

1253 – **Position and Space given to Individuals in the Selection of Plants.** – MITSCHERLICH, EILH. ALFRED in *Zeitschrift für Pflanzenzüchtung*, Vol 1, Part 3, pp 275-285. Berlin, July 1913.

In plant breeding, the selected individuals are certainly planted further apart in order to allow of their increasing as rapidly as possible; the space given is, however, never large enough to permit of the single plants developing without being affected by their neighbours. As, however, the comparison is primarily made between the selected individuals, and not between single groups of individuals, these plants must grow under the same external conditions, for only thus can a correct comparative judgment be arrived at respecting the internal characters, and individual characteristics of the selected plants. This can only be obtained by giving the latter sufficient space to exclude all possibility of reciprocal influence. Further, in order to ascertain the progress made in the selection process, we have two criteria: firstly, the average of all single observations, which show for instance, that the grain yield increases from year to year, or that the sugar yield of the beets increases. If the external factors are equalized from year to year, the progress of selection during the series of years in question follows the logarithmic function of the law of the minimum (Mitscherlich (1),) for the yield is here the function of the internal vegetation factors. This means that newly selected plants make more progress in the first year than in the second, and more in the second than in the third, etc. The second criterion of the progress of selection follows of necessity from the first; it is determined by the fact that the amount of probable deviation, which can be estimated from observations made upon all the offspring by means of the averages, and which show how far the single individuals deviate from the average for the time being, becomes smaller from year to year, and that consequently the selection is more constant in its transmission and can therefore be continued.

It is, however, impossible to draw such deductions with safety from the figures obtained by the methods of plant-breeding which are at present in use, because the influences of the neighbouring plants vary from year to year and thus prevent any estimation of the increased constancy of the variety, while the yearly varying external vegetative conditions hinder the progress made by the work of selection being recognized from the averages. The individuality of the plant, *viz.* the characters observed and required by the plant breeder, depend wholly upon internal vegetative factors. Consequently, the progress made by selected plants can only be estimated accurately if all the external vegetative factors are maintained year after year in as favourable a condition as possible. This is the goal which every plant-breeder must keep before him. There is, however, only one method to attain this end: the selected plants should be placed singly in pots sunk in the best soil available and watered daily with nutritive solutions so as to keep the soil in a saturated condition throughout the whole vegetative period. In this manner, it is possible, by keeping the cultural conditions uniform, to show not only what the selected plants can do in general, but also how they behave under certain definite conditions, keeping these also year after year as uniform as possible.

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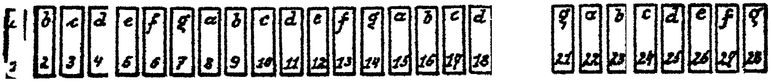
(1) *Bodenkunde für Land-und Forstwirte* 2nd Ed. Parey, Berlin 1913.
(*Author's note*).

The method of planting the selected individuals quite far apart (11 or 22 sq. ft. to each plant) and watering them as frequently as possible with nutritive solutions affords perhaps a transition to pot cultures. The soil round each plant must be kept very loose and clear of weeds. The soil of the breeding-plots should be homogeneous, and the subsoil permeable.

This method leads necessarily to a definitive breeding system which meets with all these requirements, *i. e.* pedigree breeding. Experience has fully justified the practice of first planting the offspring of selected individuals further apart, and deferring field cultivation to the second or third generation. But a number of difficulties are entailed, especially owing to the varying physical constitution and want of uniformity of large areas

These conditions must be taken into account when comparing the yields of different strains, if any clear idea of the success of the selection operations is to be obtained. To this end, control plots must under all circumstances (not only in the case of the first and succeeding generation) be established and uniformly distributed throughout the experimental area. It is well, for the sake of security, to plant at least four plots of equal size, narrow strips being the most practicable If the intermediate strips are to be turned to account, they should either be planted with seed from the same line or the same variety, or else another crop with a lower habit of growth than the lowest grown for comparison should be used in order to prevent the stems of various heights suffering from unequal amounts of shade

The writer suggests the following scheme of arrangement for the plots.



Soil of similar composition should, as far as possible, be chosen. As less difference is likely to occur in a small area, the plots selected for comparison should be of limited size. This is practicable if the above scheme of planting is adopted. The comparisons are made between the yield of neighbouring plots, these being planted with different lines (as in the plots

1-7, 2-8, 3-9, etc., 20-26, 21-27, 22-28) and compared. In this manner, according to the example, 22 comparisons can be carried out. The fact that in this way the first and last experiment are only made once, the second experiment from the right and left hand only twice, the third only three times, etc., while the seventh experiment from each side and all the intermediate experiments are compared seven times, is justified because the value of the yield of the outside plots cannot be ascertained as accurately as that of those of the central plots, seeing that the variation of the soil in front of the first lot, and behind the last lot is unknown to us. In order to obtain the average from all these figures containing elements due to the differences of soil composition it is necessary to reduce all the results to numbers which are capable of comparison; this is done in the following manner. The average is taken of the crop of adjoining plots planted with different lines, *e. g.* of, lots 1-7 in the diagram. This is taken as m_1, m_1, representing 100. The crop (e) of each of the seven plots from which the arithmetical mean was obtained is reckoned according to this base.

Thus $\frac{m_1}{100} = \frac{e_1}{x}$, or $x = \frac{100\, e_1}{m_1}$.

In comparing the yield of plots 2-8 the average is again found and expressed as m_2 the calculation being effected in the same manner.

Comparable percentages are thus obtained which are independent of the absolute amounts of the crops and can thus all be treated alike. μ_a represents the average for all lines valued as α, with their probable deviations; the average of lines, of b value is taken as μ_b, etc. Further, the average M.; is also obtained of all the averages m_1, m_2, ...; so the actual figures are easily found by multiplying the single values μ_a, μ_b ... (and their probable deviations) by M and dividing the result by 100. In this way, the average values of the single lines (allowing for differences in the soil) are obtained and the defects of the crop resulting from the inequality of the soil are, as far as possible, excluded.

This method of reckoning is naturally only effectual when the parallel experiments already made show signs of unequal soil conditions.

The number of lines used for such an experiment can be either small or very large; in the last case, the only limit to the extension of the experimental ground is the increasing difference in the soil composition. If more than seven lines, or varieties, are used for comparison, it is well to have a second row of experiment plots and again to plant line α as a standard of comparison, etc; by this means the method can be adopted in all cases.

CEREAL AND PULSE CROPS

1254 - **Experiment on Thick and Thin Seeding of Wheat carried out at the State Farm, Chapman, Western Australia.** — Report by GEO SUTTON, Commissioner for the Wheat Belt of the State of Western Australia. *Communicated to the International Institute of Agriculture.*

An experiment to determine the correct amount of seed wheat to use for hay and grain crops was conducted by the Manager, Mr. J. Langfield, at the Chapman State Farm during the past year.

In this trial the effect of using three different quantities of seed per acre, *viz.* 30, 45 and 60 lbs., was determined.

The plots were arranged according to the attached sketch. It will be noticed that the plots were in pairs, so that one of the pair could be harvested for grain, the other for hay. A buffer plot or division, a drill width wide, was located adjacent to each pair of plots to facilitate harvesting operations. This division was cropped but was harvested for hay. Small uncropped divisions about two feet wide were left between the different plots to separate them. The first pair of plots and every alternate pair were planted with medium quantity (45 lb) of seed per acre. These plots were to act as check plots by which the yields of the other plots could be compared.

The land used for the experiment is a rather free-working sandy loam. It was fallowed 4 inches deep in the spring of 1911 with a shearer mouldboard plough.

As the paddock was very weedy, it was decided to delay the planting until the autumn rains had started the weeds and then destroy them by cultivation. This caused the sowing to be late. After the rains came and the weeds had germinated, the ground was cultivated twice with a spring-tooth cultivator. The seed was then drilled in with 80 lbs. of superphosphate per acre on June 15. After drilling the ground was harrowed.

The variety used was "Comeback". The seed was obtained from the previous main crop of the Farm. It was not graded, but had been re-winnowed with a Bagshaw winnower, and the small grains taken out. After planting, the crop received no attention until harvest time.

When the crop was fit to cut for hay, the ends of the plots were trimmed off and the area reduced to ¼ acre each. The buffer plots were then cut out and the plots intended for hay harvested with a reaper and binder on October 14,1912.

The results obtained were as follows:

Hay Yields.

Plot — No.	Amt. of seed per acre — lbs.	Yield of plot — lbs.	Computed yield per acre — lbs.	Average of check plot — lbs.
2	45	663	2 652	2 670
4	30	580	2 320	
6	45	672	2 688	
8	60	602	2 408	2 464
10	45	560	2 240	

When the yields of the two check plots on either side of the other plots are averaged, it is seen that the results from the medium sowing are greater than from either the lighter or heavier. The difference in the case of the light sowing is at the rate of 350 lbs. per acre, and 56 lbs. in the case of the heavy sowing. In the latter case it is so slight as to be negligible. If the results of the medium sowing are expressed as 100 and the other results as percentages of this, they will be as follows:

Light sowing	87
Medium »	100
Heavy »	98

The other plots intended for grain were harvested with a stripper harvester on November 25, 1912. The results obtained were as follows:

Grain Yields.

No. of plot. —	Amt. of seed per acre — lbs.	Yield per plot — lbs.	Computed yield per acre — lbs.	Average yield check plot — lbs.
1	45	260	1 040	1 036
3	30	240	960	
5	45	258	1 032	
7	60	250	1 000	1 056
9	45	270	1 080	

The general results of the grain trial, like those of the hay plots, are in favour of the medium sowing. Expressed as percentages of the results from medium sowing the results are:

Thin sowing	93
Medium »	100
Thick »	95

The results obtained are those of only one experiment conducted in a single season. They cannot, therefore, be considered in any way conclusive. They are, however, suggestive and cause one to wonder whether the almost universal practice of sowing a bushel or more of seed per acre is a sound one.

The Rainfall at the Chapman State Farm during the year was as follows:

Rainfall 1912: *Chapman State Farm.*

January	0.00 in.	Prior to planting	
February	0.06 »		
March	0.09 »		
April	0.33 »		
May	2.13 »		
June 1-14	0.60 »	1.34 in.	
June 15-30	0.74 »		
July	5.40 »	During growing period of hay section	During growing period of grain section
August	1.65 »		
September	3.81 »		
October	0.83 »		
November	0.26 »		
December	1.36 »		

Total for Year	17.26 inches
Prior to planting	3.21 »
During growing period of hay section . .	12.43 »
During growing period of grain section . .	12.69 »

Sketch of thin and thick seeding

	Buffer Plot.	45 lbs. per acre.	1 drill width	
1 2	Check Plot	45 lbs. per acre.		For grain For hay
	Buffer Plot	45 lbs per acre. 30 lbs per acre.	1 drill width 1 drill width	
3 4	Thin seeding.	30 lbs. per acre.		For grain For hay
	Buffer Plot.	30 lbs. per acre. 45 lbs. per acre.	1 drill width 1 drill width	
5 6	Check Plot	45 lbs. per acre.		For grain For hay
	Buffer Plot . . .	45 lbs. per acre. 60 lbs. per acre.	1 drill width 1 drill width	
7 8	Thick seeding	60 lbs. per acre.		For grain For hay
	Buffer Plot	60 lbs. per acre. 45 lbs. per acre.	1 drill width 1 drill width	
9 10	Check Plot	45 lbs. per acre.		For grain For hay
	Buffer Plot	45 lbs. per acre.	1 drill width	

FORAGE CROPS. MEADOWS AND PASTURES

1255 – **Elephant Grass or Napier's Fodder: *Pennisetum purpureum.*** — WALTERS, J. A. T. in *The Rhodesia Agricultural Journal*, Vol. X, No. 6, pp. 833-836 + 5 plates. Salisbury, Rhodesia, August 1913.

This article is an account of the experiments conducted since the publication in February last (1) of a description of this grass as a new forage plant.

Owing to its succulent character and coarseness of stem it does not make good hay, but as green fodder for stall-fed animals it can hardly be excelled by any other crop in Rhodesia.

Propagation. — The best means of establishing a plot of this forage crop is by rooted slips planted singly in rows four feet apart and three feet between the plants. After two or three years it will be possible to transplant every alternate row, leaving the rows eight feet apart.

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(1) See No. 499, *B.* May 1913. (Ed.)

If cuttings are to be used they should be taken from mature plants in May or June and each cutting should be from 18 to 24 inches long and planted slantwise with about two-thirds below the ground.

This plant shows remarkable resistance to drought and frost and also responds readily to irrigation, but in damp situations where water is liable to stand, it wilts and is best replaced by paspalum. On dry situations, red or sandy soils, and in cold localities, it is much to be prefered to sugar cane and will give better results both in weight of fodder and food value.

Yield. — During 1912-13 the plot was cut twice when the plants had reached a height of 6 to 7 feet and before they showed the least signs of flowering. Each cutting gave 12 to 15 tons per acre of green fodder. If the cutting were delayed until the plant attained a height of 10 to 12 feet the produce of one cutting would amount to about 15 to 20 tons per acre and this would form good ensilage either alone or with maize or velvet beans.

FIBRE CROPS 1256 - **Cotton Farming in the Southwest.** — COOK. O. F. in *U. S. Department of Agriculture, Bureau of Plant Indnstry, Miscellaneous Papers, Circular* No. 132, pp. 9-18 Washington, July 1913.

The south-western States appear to be particularly suitable for the cultivation of cotton. The dry climate affords protection against the boll weevil and other pests that often reduce and destroy the crop in the East. The dry harvest season also allows the western cotton to be gathered and sent to market in better condition. But the possibilities of this region are not yet appreciated, and the agricultural population is still very small, resulting in a high cost of labour and transport.

The writer emphasizes the importance of a highly trained population capable of adapting themselves to local conditions and of producing a high-grade cotton of the Egyptian long-staple quality.

Present methods of living and work are unsuitable, and often end in disaster and discouragement. These conditions must be improved, better systems of houses must be constructed suitable for summer heat, and irrigation works extended.

1257 - **The Cultivation of Sisal Hemp in Tunis and the Production of Fibre from its Leaves.** — GUILLOCHON, L. and GAGEY, R. in *Bulletin Agricole de l'Algérie et de la Tunisie,* Year 19, No. 12, pp. 253-269. Algiers, June 15, 1913.

Experiments have been carried out with *Fourcroya gigantea* and *Agave rigida* var. *Sisalana* in the Experimental Garden at Tunis.

The results from six-year-old plants are as follows :

	Wt. of raw material — kg.	Wt. of dry fibre — kg.
Fourcroya	58	0.980
Agave	62	1.660

Thus Sisal gives a much higher yield of fibre. From calculations of the cost of cultivation the writers draw the following conclusions

1) The cultivation of Sisal hemp is profitable in Tunis, provided the market value is high.

2) At the price of 3 ½ d. per lb. a net profit of 27s per acre per annum during the first six years and 13s per annum afterwards is possible; this is quite a good return for land of medium quality.

1258 – The Cultivation of Cowstring Hemp (*Sanseviera*). —

MICHOTTE, F in *L'Agriculture pratique des pays chauds*, Year 13, Nos. 122 and 123, pp. 356-375 and 455-474. Paris, May and June 1913.

The writer summarises the little knowledge available on the cultivation of this hemp, he shows that its cultivation may be of considerable importance, provided the mistakes so far frequently made are avoided.

The fibre obtained from this plant is very durable even under water and for this reason is very suitable for the manufacture of ship's ropes. When well prepared it has a higher market value than Sisal hemp. As a crop it has two distinct advantages: it can be harvested at any time of the year after it has grown to maturity, and may be decorticated a long time after harvesting with no more loss than a little extra work in removing the hardened parenchyma. It requires fewer machines, as they can be kept at work throughout the year; at the same time stoppages of the machines or of picking do not create any difficulties.

The writer finds it difficult to give details concerning the yield of this plant owing to the variability in the weight of the fresh leaves and the percentage of fibre, but he believes that it gives the highest yield of all the textile plants, varying from 5 to 5 ½ tons of clean fibre per acre.

Notwithstanding the advantages of this crop, its cultivation does not increase and this fact the author attributes to the unsuitability of machinery. For overcoming the difficulties of transport of the raw material (leaves) he suggests the adoption of light portable machinery of moderate capacity.

SUGAR CROPS

1259 – Contribution to our Knowledge on the Influence of Sugar-Cane Cultivation on the Productivity of the Land when put under Maize and Rice. —

VAN DER STOK, J. E and VAN HAASTERT, J A. in *Archief voor de Suikerindustrie in Nederlandsch-Indië*, Year 21, No 30, pp 943-949 Sourabaya, July 1913.

The effect of sugar-cane cultivation on the soil and the crops which follow it has been receiving the attention of the Government in Java for some time, with a view to safeguarding the interests of the native cultivator who lets his hand to the sugar grower.

The authors conducted their experiments with 32 plots of 1300 Rhine feet (5 ¼ rods) each in area and divided into two series. Series A was planted with sugar-cane (variety No. 247) and series B was sown with earthnuts. In the following year the whole of the plots were planted with maize and the following yields obtained:

Series *A*	0.6 picul (about 81 lbs.)
Series *B*	0.4 picul (about 54 lbs.)

Thus the maize was benefited by the sugar-cane.

Next year rice was taken; allowing for experimented error, the yield was the same in the two series.

From these expeirments the writers conclude that the natives have no reason to fear the exhaustion of the soil by sugar-cane cultivation.

RUBBER, GUM AND RESIN PLANTS

1260 - **The Coagulation of Hevea Latex by Smoking.** — CAYLA, V. in *Journal d'Agriculture Tropicale*, Year 13, No. 146, pp. 231-236. Paris, August 31, 1913.

The writer states that plantation rubber has not yet been made equal in quality to that of "Up-river Fine Hard Para", the superior quality of which is attributed to the Amazonian smoking methods. He believes that the chemical composition of the smoke used on the Amazon has no such special action that other materials cannot be used for burning, but that the physical and mechanical conditions of coagulation and drying determine the ultimate quality of the rubber.

Mechanical effects — The layers of rubber coagulated by smoking are very different in quality from that of the commercial product.. The coagulum is of a creamy white colour, of medium elasticity and considerable plasticity. Its physical constitution is gradually changed and its volume reduced; water is given off and it darkens until it becomes black outside. This slow contraction continues for days and even weeks. In this way is effected spontaneously the work that is done by machinery in the plantation factories. The coagulation of the latex in successive layers favours this spontaneous contraction, as each layer increases the compression of the inner layers.

The writer believes that the superiority of the spontaneous contraction of the Amazonian rubber over the mechanical pressing of the plantatión product, lies in its slow, regular and continuous action, which has a very important effect on the quality of the rubber.

VARIOUS CROPS

1261 - **Exports of Tobacco from Hungary.** — (Abstracted from the "Commerce et Industrie de 1912 en Hongrie" published by the Chamber of Industry and Commerce at Budapest) in *Magyar Dohanyujsag*, Year XXX, No. 18, pp. 4-5. Budapest, September 20, 1913.

In 1895, the first year of reorganisation, the exports of Hungarian tobacco into the countries levying import duties amounted to only 4 800 000 lbs.; since then it has gradually increased, until in 1912 it exceeded 25 000 000 lbs.

During the last five years the Hungarian Tobacco-Merchants, Society has exported the following quantities:

	lbs.
1908	19 740 000
1909	20 710 000
1910	22 210 000
1911	20 980 000
1912	25 625 000

The quantities of tobacco exported from Hungary to various countries during 1912 are given below:

	lbs.
France	5 790 320
Netherlands	6 752 120
Belgium	1 030 610
Mediterranean Ports	5 469 240
Germany	2 700 600
Switzerland	1 554 200
Denmark	419 840
England	1 332 170
Egypt	156 310
Portugal	427 080
Total	25 632 490

1262 – **Coca and the Cocaine Industry in Peru.** — POZZI-ESCOT, EMM. La Coca et sa Culture. Extraction de la Cocaïne. — *L'Agronomie tropicale*, Year 5, Nos. 4 and 5-6, pp. 39-52. Uccle, April-June 1913.

For many years Peru was the chief producer of coca, and consequently also of cocaine; but this cultivation is now practised with great success in the Far East. The increased production has lowered the price to one half its former value and left only a very narrow margin of profit for the grower. This situation requires the attention of the agriculturist and chemist before any improvement is possible.

The two principal coca districts of Peru are the upper valley of the Rio Chicama and the region of Huanuco.

1. *The valley of the Chicama.* — This valley is situated on the western slopes of the Andes and the crop is grown at an altitude of 1500 to 3000 m. (5000 to 10 000 ft). This region enjoys the dry climate characteristic of the high Cordillera, and the soil is poor.

2. *The Huanuco region.* — This region, known as the montaña, has a tropical climate: constant heat with high humidity. The soil is a rich alluvium, characteristic of damp tropical regions with luxuriant vegetation.

The coca of Huanuco is considerably richer than that of the Rio Chicama, the amount of cocaine in 1 kilo of dried leaves being 8 to 10 grams and 5 to 7 grams respectively in the two districts.

Cultivation under shade is easier, requiring less water and less work, and giving a greater total production of leaves. This is therefore, a better system of cultivation for exporting the raw coca, but the yield of alkaloid is considerably less than from plants grown without shade, sometimes only a third as much.

For increasing the yield of cocaine it is desirable to cut back the shrubs in order to encourage the development of young leaves which contain the highest proportion of the alkaloid. Before planting, the land should be entirely worked; the method of planting in pits must be abandoned, as the roots do not succeed in making their way out. The author recommends the use of dynamite for effecting this operation economically.

While in the growing of coca there is ample room for improvement this is still more the case with the process of extraction. In this case it is advisable to pass the leaves through a mill and effect the extraction by diffusion, thus reducing the operations and obtaining a better yield. It would also be advantageous to collect the precipitate formed on the addition of alkali by means of a filter press

A point of considerable importance is the extraction of ecgonin, which should be carried out by a methodical exhaustion of the leaves by means of a warm slightly acid liquid in diffusers similar to those employed in the tannin industry. This method would allow of utilizing the old or fermented leaves in which the cocaine has been destroyed, leaving only the ecgonin. By this method of extraction the yield of alkaloid is almost doubled and the industry made more profitable.

FRUIT-GROWING.

1263 - **Cultivation of Limes in Dominica.** — DESLANDES, R. and CHALOT, C. in *L'Agriculture pratique des pays chauds*, Year 13, Nos. 120 to 123. pp. 177-195, 306-327, 388-403 and 437-443. Paris, March-June 1913.

Lime growing is a profitable industry in several of the British Antilles. Along with cacao it has changed the economic feature of Dominica, which at the time of the sugar-cane crisis of 20 years ago had no other agricultural product to fall back on. This article points out the value of the lime industry for the French Antilles and other countries liable to suffer the consequences of relying on a single crop.

The variety cultivated in the British Antilles is *Citrus medica* var, *acida*, which includes two cultivated varieties: the "common lime" and the "spineless".

The common lime produces a small fruit yielding a large quantity of juice. The spineless variety is of growing importance. The maintenance of the plantations and the picking of the fruits is easier and the content of citric acid is greater than that of the common lime, though the yield of juice is less.

The best conditions for growing limes are: 1) Altitude not greater than 400 m., (1300ft.; 2) rainfall of at least 100 to 120 in., distributed evenly throughout the year; 3) a gentle slope facing south or south-west; 4) soil rich in potash and nitrogen, and well drained; 5) proximity to a port.

The writers describe the various cultural operations. The pips are sown in nurseries and the young plants are planted out when they have reached a height of 16 to 18 in.; they should be 15ft. by 15 ft. on the level, somewhat less on slopes. Some planters intercrop their trees with *Xanthosoma sagittifolia* and *Colocasia esculenta* for the first two years. Limes are greedy of nitrogen and potash. Green manuring with *Canavalia ensifomis* and *Cajanus indicus* suffices to supply the former. Suckers and dead branches should be removed as often as possible.

Limes are liable to the attacks of two scale insects: *Mytilaspis citricola* and *Lecanium viride*, which do considerable damage. Spraying with a parafin or soda-lye and resin wash is generally employed against these enemies. The lime borer (*Deptostilus praemorsus*) often causes serious damage. Cutting and burning the dead wood and blocking up the holes is adopted to kill the larvae.

Most of the fruits are used for the extraction of juice, and as the formation of acid is not completed until the fruits are fully matured, they are not gathered directly but allowed to fall to the ground. The average annual yield per acre varies between 22000 and 36000 lbs.

The juice is extracted in mills, rarely by pressure, and strained through a fine copper sieve to remove the organic matter which would give rise to fermentation and deteriorate the product. It is prepared for commerce in three forms : raw juice, concentrated lime juice and citrate of lime.

The raw juice is extracted by means of granite rollers to obtain the product as pure as possible. It is used in medicinal products and choice liqueurs, but owing to its lack of keeping qualities the quantities exported are decreasing.

Concentrated lime juice is obtained by evaporating the raw juice to $^{1}{}_{10}$ or even $^{1}{}_{12}$ of its volume. Owing to its concentration it has excellent keeping qualities and a low cost of transport.

The preparation of the concentrated juice involves several disadvantages: *a*) a loss of 8 per cent. of citric acid; *b*) use of considerable quantity of fuel; *c*) a dark coloured product; *d*) heavy expenses of packing with liability of loss.

To obviate these defects citrate of lime is prepared, as at Palermo, by the addition to the juice of a lime salt. This must be free from impurities such as magnesium, iron, alumina. The usual substance employed is spent lime prepared by burning corals. The point of complete neutralisation must not be reached, or the impurities will be precipitated in the citrate of lime. Complete neutralization is attained by means of chalk. The precipitate is washed by a jet of warm water, and put through a filter press and afterwards dried. It is brought to about 10 per cent. of water; it is then free from liability to ferment and contains about 70 per cent. of pure citric acid.

Some plantations prepare essence of limes; the profits from this fully cover the expenses of the treatment of the raw juice.

LIVE STOCK AND BREEDING.

1264 - **Cattle Dipping at Short Intervals.** — LAWS, H. E, in *The Agricultural Journal of the Union of South Africa*, Vol. V, No. 6, pp. 871-879. Pretoria, June 1913. HYGIENE

Before the outbreak of East Coast Fever and the discovery by Lounsbury that it was transmitted by the brown tick, cattle dipping was not considered necessary more often than once a fortnight, or just sufficient to keep the ticks in check. When it was realised that this tick spends a comparatively short time of its life history on the host and it became necessary to eradicate it, more frequent dippings than once in five days had to be resorted to.

Four varieties of brown ticks: *R. appendiculatus*, *R. capensis*, *R.*

simus and *R. nitens*, and the red-legged tick (*R. evertsi*) are capable of transmitting the disease from a sick animal to a healthy one. The last-named tick has two hosts and spends more than five days on each.

The brown ticks, on the other hand according, to Watkins-Pitchford's investigations, require a minimum larval period of 68 hours and a nymphal stage of only 72 hours. It is therefore necessary to adopt a three-day dipping period in order to stamp out all the ticks from an infested farm.

This system, however, has not been an unqualified success in Natal and the Cape Province. The reasons for this are many. The larval and nymphal red ticks are usually found low down in the hollow of the ear, whilst brown ticks in all three stages infest both the inside and outside of the ears and around the eyes. Dipping baths are inadequate if the animal is not obliged to take a "header".

The strength of dip recommended for three-day dipping is one part arsenious oxide to 1250 parts of water—or 1 lb. arsenite of soda (80 % arsenious oxide) to 100 gallons of water Watkins-Pitchford found that this solution combined with an emulsion and applied every three days was sufficiently strong to stamp out East Coast Fever. It killed the ticks on the animal and the emulsion ensured a uniform protection against further pathogenic ticks.

The following experiments were carried out in March 1910 to ascertain what strength of dip is required, its effect on the cattle and at what intervals it must be used in order to prevent ticks from feeding on the dipped animals. No pathogenic ticks were available for these experiments, so that freedom from ticks had to be taken as sufficient criterion of the efficacy of any particular treatment.

Cooper's Cattle Dip was used in two strengths 1-150 (arsenious oxide 1 part in 600 parts of water), and 1-200 (arsenious oxide 1 part in 700 parts of water).

Infestation of the experimental cattle was maintained by allowing undipped infested cattle to run alongside them.

The dip was applied by hand spraying, and the cattle were thoroughly overhauled before and after treatment and the difference noted.

The animals were sprayed 20 times in all and generally all the brown and red ticks were killed at each spraying. After the second spraying no adult blue ticks were found. About 50 per cent. of the male bonts and a few of the female bonts were killed at each spraying. In one instance two female bonts stayed on throughout the whole series of experiments (94 days). No tick of any species engorged itself during the period.

As a result of these experiments the author concludes: 1) it is possible to apply an emulsion containing arsenious oxide (1 in 800) every four days and one of strength 1 in 600 every five days without injury to the cattle; 2) four-day spraying will keep cattle practically free from ticks in an infested area: 3) a hand dressing of the ears and tail is desirable to supplement the spraying: 4) whenever East Coast Fever threatens, all cattle should be dipped every five days with an emulsion of 1 in 800, and if an outbreak occurs, the interval should be reduced to four days.

1265 - **Experimental Investigations into the Relationship between Human and Bovine Tuberculosis.** — EBER in *Centralblatt fur Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 70, Part 5-6, pp. 220-278. Jena, August 23, 1913.

Since early in 19 3, continuous investigations into the connection between human and bovine tuberculosis have been carried out at the Veterinary Institute of the University of Leipzig. Detailed studies have, so far, been made of tuberculosis in 16 children, 3 women, 12 men and 9 cows.

The writer first gives a detailed account of the order of the different operations in the experiment (inoculation of human material into cattle, introduction of bovine tuberculosis into cattle etc.), and then gives the data of the experiments which are noted chronologically in an appendix and described from a uniform point of view. He concludes that bovine tuberculosis constitutes a source (and in the case of children, one which should not be underrated) of human tuberculosis. The presence in the alimentary canal of a child of the bacilli of bovine tuberculosis gives rise to alterations which may result in death, and in no way differ either macroscopically or microscopically, from those due to the bacillus of human tuberculosis. Further, in the case of adults who have died from general tuberculosis, sometimes the bacilli of the bovine form have proved to be the sole pathogenic agents.

Systematic intraperitoneal, and simultaneous intraperitoneal and subcutaneous injections were made into cattle using human bacillus which is harmless to the latter. The material was inoculated after passage through a guinea-pig. This treatment in many cases produced peritoneal tubercles; intraperitoneal and subcutaneous inoculations were simultaneously made from these and proved very virulent in their action on the cattle used for the experiment. The writer only once succeeded in producing similar effects by simultaneous subcutaneous and peritoneal injections of pure cultures of material obtained from human subjects,

While pure cultures from the peritoneal tubercles of the cattle first inoculated, when introduced by subcutaneous inoculation showed increased, but not yet typical virulence, pure cultures from the peritoneal affections occurring in cattle which had died of acute tuberculosis due to inoculation were excessively virulent. In 2 out of the 7 cases of increased virulence, it happened that the material from the human subjects contained exclusively bovine tubercle bacilli, which from their long stay in the human body, had forfeited their toxic property, slightly in the one case, but to a considerable extent in the other. No such explanation exists in the other 5 cases of increased virulence; further, there is no ground for the belief that the bacilli of bovine tuberculosis were associated from the beginning with those of human tuberculosis in the material obtained from human subjects, or introduced in the course of the experiments.

The writer therefore regards the systematically increased virulence produced in these 5 cases by further inoculation as type changes, and considers it a proof of the near relationship between the two varieties of tubercle bacilli occurring in mammals, and entitled by Kossel, Weber, and Hanss, *Typus humanus* and *Typus bovinus* respectively. Whether the change of type is caused by certain peculiarities of the bacilli present in the human material, or by the individual characteristics of the cattle experimented upon, or whether it depends upon both these factors, the writer could not determine.

ANATOMY AND PHYSIOLOGY

1266 - **Contributions to the Knowledge of the Ferments of the Mammary Glands and of Milk.** — GRIMMER, W. in *Biochemische Zeitschrift*, Vol. 53, Part 6, pp. 429-473. Berlin, July 24, 1913.

The object of the investigator was to determine whether milk ferments are present in the mammary glands, and whether resting or active mammary glands show any difference in their ferment content. The glands of cows, mares, ewes and sows were used in the investigation. They were first freed from all visible blood vessels, and from the connective tissue and fat, and then crushed to a pulp. From the latter, extracts were obtained by auto-digestion and by the use of common salt and of glycerine, and a juice by pressure. All of these were tested by the writer with the following ferments: protease, ereptase, monobutyrase, amylase, salolase and peroxydase. In many cases, an examination of the milk followed that of the mammary glands.

The results are given in seven tables, and show that proteolytic ferments were present in the resting and active mammary glands of the four species investigated. The only difference was that the products of protein decomposition from the active glands always contained tryptophane, which was not the case in the resting glands. This discovery leads to important conclusions regarding the function of active mammary glands. The function of the proteolytic ferment of resting mammary glands is probably, like that of the proteolytic ferment present in other organs, to bring about the metabolism of the cells of the gland, and for this the disintegration of tryptophane is unnecessary. On the other hand active mammary glands which produce casein, require a ferment to effect the synthesis of this compound. The writer believes that the body protein when turned into milk protein is entirely split up into its components. This is rendered probable by the fact that the auto-digestion products of the resting glands always contain albumoses and peptone, substances which are absent from the active glands.

In his investigations of ereptase, the writer found that the extracts of active and resting glands were able to separate tyrosin from silk peptone Whether this separation was due to the proteolytic ferments, or to ferments which only split up peptones and polypeptides, could not be discovered. It is probable that the peptolytic and proteolityc ferments are not the same. The peptolytic ferment is much weakened by the autolysis of the glands and also by the dialysis of the extracts and press-juice.

The active and resting mammary glands of all the animals examined also contained a monobutyrin-splitting ferment, the effect of which was much diminished by dialysis. It is therefore probable that the mammary glands are the source of the monobutyrase of milk.

The mammary glands of mares and sows possess, in the resting and active stages alike, a powerful ferment for breaking up starch. In the case of the cow the resting glands have much more power of breaking up starch than the active ones. The resting glands of the ewe have no special amylolytic property From this, the writer concludes that the amylase in the milk of different species is an original ferment

All the press-juices and salt extracts examined also have the power of breaking up salol. Contrary to the opinion hitherto held, the writer believes that this power of decomposing salol is not a saponification due to alkalinity, but a pure ferment action. This is rendered probable by the fact that, through dialysis, the alkaline reaction of the extracts with litmus wholly disappears without any loss of the power of breaking up salol. Further, salolase can be destroyed by heating neutral solutions containing it and without appreciably altering their alkalinity. The writer also succeeded in precipitating the salol-disintegrating agent by means of ammonium sulphate and subsequently re-dissolving the precipitate with water.

As a result of his investigations of peroxydase, the writer concludes that the power of oxydising guayacum tincture possessed by the milk of cow, ewe and goat is not attributable to inorganic catalytic agents, but is a process of a ferment nature. This ferment should be regarded as original and formed when the gland begins active secretion. No ferment capable of colouring guayacum tincture blue seems to exist in the glands of mare or sow, in the resting glands of cow or ewe or in sow's milk. In these, the writer merely found in all cases a ferment which oxydises paraphenylenediamine and was easily destroyed by heat.

In conclusion, the writer touches on the functions of these ferments; he thinks that they are concerned with milk production, but does not explain the part they play in the process.

1267 - **A Method of Determining Early Stages of Pregnancy in Mares.**— BERNHARDT in *Zeitschrift für Gestütkunde und Pferdezucht*, Year 8, Part 7, pp. 145-148. Hanover, July 1913.

BREEDING

The investigations made by Professor Abderhalden at Halle-a-S. regarding the ferments present in the bodies of animals have proved that substances foreign to the species, and especially those foreign to the blood, when introduced directly into the latter, quickly disintegrate and disappear. This disintegration is due to the action of ferments which make their appearance shortly after inoculation (sugar after a few minutes, and protein within three or four days). The introduction of substances proper to the blood, on the other hand, leads to no ferment formation. If the substance used for inoculation is protein, the ferments which develop are protein-destroying enzymes; if raw sugar is introduced, the ferments formed are those which possess the property of breaking up sugars. The introduction of fat into the blood by means of a diet rich in fatty substances leads to the production of ferments which split up fat. The power possessed by the blood of breaking up these compounds lasts for from two to three weeks after the introduction of the latter, and disappears as soon as the foreign substances become incorporated into the blood.

Protein-destroying ferments are therefore always to be found in the blood of an animal when it becomes pregnant. These ferments have the property of breaking down placenta-protein; they disappear again in from 10 to 14 days after the birth of the young. Animals which are not pregnant have no ferments in their blood plasma capable of breaking up placenta-protein.

On the basis of these observations, Prof. Abderhalden has devised a chemico-biological method by means of which it is possible to determine whether an animal is pregnant or not, the earliest stages being capable of detection (1).

The writer gives a description of this method, and sets forth in detail how it may be applied to mares. The method consists in introducting into the blood serum of a mare a fragment of placenta-protein foreign to the species ("Artfremd"); the mixture is dialysed and the product investigated. If peptone is present this testifies to the existence of ferments in the mare's blood; if the peptone reaction is absent, the blood lacks ferments. Thus, according as to whether the blood contains ferments or not, the pregnancy or non-pregnancy of the mare can be determined. The reliability of this method depends upon the care with which it is carried out. It is therefore advisable to follow carefully the given directions:

I. — *The composition and preparation of the dialysing membranes.*

The best membranes are those supplied by Messrs Schleicher and Schüll (Germany); these are supplied to the market marked 579 A. As soon as they arrive the membranes should be boiled for 5 minutes in distilled water; they should be kept in the same water. Before use, the membranes must be tested for impermeability to proteins and permeability to peptones. These tests are carried out as follows:

a) *Test for impermeability to protein.*

5 c.c. of freshly filtered egg-albumen are put in a graduated cylinder, water is added to make up 100 c.c, and the whole well shaken to mix it. Then 2.5 c.c., of this mixture are placed in a membrane which has been softened for ½ hour in cold water, the exterior of the membrane is well washed, and the membrane placed in an Erlenmeyer flask containing 20 c.c. of distilled water. Upon the membrane and the contents of the flask a ½ cm. layer of toluol is poured. The whole is now covered with a watchglass and put into an incubator to dialyse. After 16 hours, the solution may be tested for protein. For this purpose, 10 c.c. are placed with 0.2 c.c. of 1% solution of ninhydrine (triketohydrindenhydrate) in a graduated reagent glass, mixed, and boiled over a Bunsen burner (a sterilized glass rod 10 cm. long being introduced to prevent bumping). The whole must be well boiled (every membrane alike) but loss of substance should be avoided. The time when the first gas bubbles appear on the side (usually after a few seconds) is noted; the glass is then held in the flame till the liquid boils

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(1) A description of the scientific principles and of the technique of the method are given by the above-named investigator in his book: "*Abwehrfermente des tierischen Organismus*", 2nd Edit. Springer, Berlin.

We are indebted to this work for the description of the method, and have made use of it to some extent in making this abstract. (*Ed.*).

vigorously; it is then held in the side of the flame half way up till one minute has elapsed from the appearance of the first gas bubbles. When the reagent glasses are cool, the colour of the fluid is examined. If it is colourless, the membrane which contained it is impermeable to protein; if the liquid is coloured blue, the corresponding membranes are useless and should be rejected.

b) *Test for equal permeability to protein decomposition products.*—All the membranes which have been proved to be impermeable toprotein, are thoroughly cleaned by being first placed for ½ an hour in flowing water and subsequently ½ minute in boiling water. They are then prepared with 2.5 c.c. of 1 % silk peptone solution (" Pepton Höchst "), washed externally and placed in a flask with 20 c.c. of sterilized water. The contents of the flask and the membranes are again covered with a ½ cm. layer of toluol and a watchglass, and are placed in an incubator to dialyse. After 16 hours, the dialysed solution is examined for diffused peptone, the same method being used as in the case of the protein. The water in which the membranes were boiled, in all the reagent glasses, should, if the membranes are all equally permeable, be coloured the same degree of blue. If the tint given by some membranes is lighter or darker than the average colour, the membranes are to be rejected as worthless.

The good membranes are first washed, then placed in boiling water for 30 seconds, and finally put into sterilized water to be kept.

The flasks in which they are preserved must be quite full of water.

II. — *Preparation of the placenta protein.*

After the membranes have been tested, the placenta-protein is prepared. Fresh placenta only should be used. This is first externally freed from blood by being put into a physiological solution of common salt; the chorion and the umbilical cord are then removed and the placenta is cut into pieces about the size of a shilling and crushed in flowing ordinary water. The pieces are pressed in a cloth from time to time. All those which are not easily freed from blood are rejected. The others are then reduced to a pulp until they form a snow-white mass of tissue, and boiled in an enamelled pot with 100 times their volume of distilled water containing five drops of glacial acetic acid per litre. The pulp is boiled for 10 minutes, the water is poured off through a hardened filter and washed; the pulp is then washed for 5 minutes in distilled water, and the boiling is repeated, fresh water being used without the addition of acetic acid. This process is best repeated about six times without interruption. Finally the boiled water (filtered) is tested for protein decomposition products, 5 c. c. of the liquid being mixed in a beaker with 1 c. c. of 1 % ninhydrine solution, and the whole boiled over a burner, as in the case of the membrane testing. If a blue colouration appears, the mixture is boiled till this is no longer visible. At this point, the placenta is placed in sterilized water in a bottle with a ground-glass stopper, covered with a layer of chloroform and toluol reaching to the stopper, and set aside. Placenta-protein thus prepared keeps a long time.

III. *Method of obtaining the blood serum.*

Blood to the amount of 15 to 20 c. c. is taken from the mare to be investigated when the animal is fasting; a dry needle is used for the operation, and the blood is at once placed in a sterilized centrifugal glass, or Erlenmeyer flask. Here it is allowed to coagulate; the serum is poured off into a sterilized vessel and submitted to centrifugal action; if there is no centrifugator the serum is left to settle in long-stemmed glasses closed by means of a rubber cap. It is necessary that the serum should be quite free from haemoglobin. After all these preliminaries have been carried out, the serum is examined for ferments.

IV. *Method of conducting the investigation.*

2 or 3 c. c. of serum are taken up in a dry pipette and placed in a tested membrane together with 1 gm. of well-shredded placenta (which has previously been examined for peptone). The exterior of the membrane is washed and the latter is put into a flask containing 20 c. c. of sterilized water. A layer of toluol ½ cm. deep is poured on the contents of flask and membrane and the flask is covered with a watch glass and stored in an incubator at 37° C. for the solution to dialyse. After 16 hours, 10 c. c. of the dialysed solution and 0.2 c. c. of 1 % ninhydrine are poured into a beaker and heated over a Bunsen burner, the same rules being observed as in the cases of the membrane testing and the examination for protein. If after the cooling of the contents of the test-tube, a deep blue colour (amethyst) appears, this proves that the serum in question contains ferment capable of breaking up placenta-protein, and therefore that the mare is pregnant. If the dialysed solution does not react with ninhydrine the mare is not pregnant. Should yellowish-red or brownish tints appear, this shows, either that the experiment has not been sufficiently carefully performed, or that the blood contains much acid or alkali. In this case, the experiment must be repeated.

The experiments should be carried out as far as possible under aseptic conditions and in an entirely bacteria-free room. The methods are, of course, suitable for adoption in the case of all other animals.

1268 - **Results of Investigations on Heredity in Pigs** (1). — FRÖHLICH, GUSTAV in *Journal für Landwirtschaft*, Vol 61, Part 3, pp. 217-235. Berlin, July 21, 1913.

The writer reviews the observations made in Germany and the United States on the heredity of coat colour in swine. It appears that in the F_1 generation of crosses the following are dominant:

I. *White* of Improved German Swine (Edelschwein) over:
  white and black of Hanoverians
  black of Berkshires
  greyish-black of European wild pigs
  greyish-black of Cornwalls
  red of Tamworths.
  black of Caucasian wild pigs.

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(1) An article by W. W. SMITH on « Color Inheritance in Swine » in *The American Breeders Magazine*, Vol. IV, No. 2, will be abstracted in the *Bulletin* for Jan. 1914, as it was received too late for the official edition (French) of November. (*Ed.*).

II. *Greyish black* of European wild pigs over :
red of Tamworth.
III. *Black and white* of Hampshires over :
red of Tamworth.

1269 - **Report on the Woburn Calf-Rearing Experiment, 1912-13.** — VOELCKER, J. A. Leaflet published by the *Royal Agricultural Society of England*, pp. 7. London, 1913. CATTLE

This report is supplementary to the general summary published in the Proceedings of the Council, November 6, 1912, and contains further details regarding the quantities of food and methods of feeding.

Twenty bull calves (Shorthorns) were purchased in the open market when two or three days old and fed at the experimental farm on whole milk for three weeks. They were then weighed and divided into five lots according to their weights. Each lot was then put on its special diet for a period of nine weeks.

The particulars concerning each lot and its diet are as follows:

Lot 1. *Cod-liver oil and separated milk.* — The object of this experiment was to replace the fat removed from whole milk by cod-liver oil.

During the first three weeks the four calves consumed 86 gallons of whole milk costing 4*s* 2.16*d* per calf per week. The diet was then changed gradually, 4 ⅓ gall. whole milk and 1 ⅓ gall. separated milk mixed with eight table-spoonfuls of cod-liver oil being consumed during the first six days. After a fortnight the whole milk went down to 2 ⅓ gall. and the separated milk up to 3 gall. daily, and after three weeks the four calves were receiving all separated milk (6 gall. daily per lot) and so continued until the close of the nine weeks, the cod-liver oil being increased after four weeks to twelve tablespoonfuls daily. The total food consumed during this period of nine weeks by the four calves was: cod-liver oil 2 gall., whole milk 59 gall., separated milk 307 gall. — total cost £ 4 16*s* 7*d*, or 2*s* 8.19*d* per calf per week. Including the preliminary three weeks on whole milk the cost comes to £ 7 6*s* 9*d* for the twelve weeks, or 3*s* 0.68*d* per calf per week.

Lot 2. *Calf meal* (*commercial*). — As before the calves had whole milk for the first three weeks. After the weighing they took for the first week 2 ⅓ gall. of whole milk and 1 ⅓ gall. of separated milk daily along with 2 gall. of calf meal. The whole milk was gradually reduced and after three weeks the four calves took only 4 gall. daily of separated milk with the 2 gall. of calf meal. The total food consumed in the nine weeks was: calf meal 112 lbs., whole milk 37 gall., separated milk 212 gall. — Total cost £ 3 11*s* 11*d*, or 2*s* per calf per week.

Lot 3. *Gruel* (*linseed and oatmeal*) *with separated milk.* — As before the calves had whole milk for the first three weeks. For the first week after weighing, they had 4 ⅓ gall. whole milk with 1⅓ gall. separated milk daily and ⅓ gall. daily of gruel. After three weeks they were taking 4 gall. daily of separated milk and 1 ½ to 2 gall. of gruel for the lot of four. One calf had to be removed from the experiment on account of scouring and is left out in the final reckonings. The total food consumed in the nine weeks by the four calves was : oatmeal 84 lbs., linseed 14 lbs., whole milk

57 gall., separated milk 224 gall. — cost £ 4 6*s* 4*d*, or 2*s* 7.77*d* per calf per week.

Lot 4. *Whole milk.* — This lot continued the whole milk diet throughout; in nine weeks they consumed 356 gall., costing £ 10 7*s* 8*d*, or 5*s* 9.22 *d* per calf per week.

Lot 5. *Crushed oats and separated milk.* — These animals were bought a fortnight later and consumed rather more milk during the first three weeks. For the first six days of the experiment they took 1 lb. of crushed oats among them daily; as the proportion of separated milk was increased the oats were increased to 2 lbs. daily. After 24 days they were receiving 6 gall. of separated milk and 4 lbs. of oats daily. The oats were always given dry and never mixed up with the milk or made into gruel. During the nine weeks they consumed 208 lbs. of oats, 66 gall. of whole milk, and 296 gall. of separated milk, costing £ 5 0*s* 10*d* or 2*s* 9.61*d* per calf per week.

The results obtained by the different systems of feeding are compared in Table I.

TABLE I.

Lot	Food	Increase per calf per week	Cost of each lb. increase of live weight
		lbs.	*d.*
1	Cod-liver oil	9.66	3.33
2	Calf meal	8.66	2.77
3	Gruel	8.33	3.45
4	Whole milk	12.83	5.39
5	Crushed oats	13.30	2.52

From this table it will be seen that the crushed oats gave the highest gain in live weight and at the lowest cost per lb. of increase. The next highest gain was with whole milk, but the cost, it will be noticed, was much increased. Between the other feedings there was not much to choose.

At the end of the nine weeks of special feeding the calves were turned out into the yard and all fed alike with separated milk, a little linseed cake and crushed oats. Later the milk was given up and they were turned into the fields and given linseed cake, crushed oats and hay. Shortly after this (at nearly 5 months) they were castrated. At the end of twenty weeks they were weighed again and the results obtained are set forth in Table II.

TABLE II.

Food	1st Period		2nd Period.	Whole Period.
	Average daily gain per head	Cost per head per week	Average daily gain per head	Average daily gain per head
	lbs.	s d	lbs.	lbs.
1. Cod-liver oil.	1.90	2 8.19	1.63	1.74
2. Calf meal.	1.75	2 0	1.53	1.62
3. Gruel (3 calves) * . . .	1.57	2 4.67	2.01	1.84
4. Whole milk	2.00	5 9.22	1.90	1.94
5. Crushed oats (3 calves)**	2.19	2 9.61	1.90	2.00

* One calf removed from experiment owing to scouring.
** The calf died from anthrax.

Table II shows that not only did the crushed oats and separated milk feeding give the highest gain at the least cost during the feeding of nine weeks with the special foods, but that subsequently, when the calves were turned out in the fields and all fed alike, the total live weight continued to be higher with this lot than with any of the others. This leads to the conclusion that the influence of the early feeding of calves has an important bearing on their after development and that a "good start" is very essential.

It is intended to carry on this experiment until the bullocks are ready to be sent to the butcher.

1270 - **Experiments on Pig Fattening in Prussia with Automatic Feeder or Common Trough.** — DE LA BARRE in *Tierzuchtnachrichten der Landwirtschaftskammer für die Provinz Brandenburg und Mitteilungen der Versuchsstation für landwirtschaftliche Fütterungsversuche zu Karstadt (Westprignitz)*, Year 6, No. 8, pp. 114-117. Prenzlau, August 31, 1913. PIGS

The object of these experiments was to ascertain which of the two methods of feeding was the more expensive. Sixteen pigs, eight weeks old, of the improved Hanoverian breed were used: they were divided into two lots. Shortly after the beginning of the experiment one animal was removed from each group.

Group I was fed by an automatic feeder (Holtenberg's system) and group II was fed from a common trough three times a day with food slightly moistened with warm water. During the first eight days of the experiment the pigs received as drink 2 litres (1 $^3/_4$ quarts) of centrifugated skim milk to which some wheat meal and barley groats were added. The fattening was continued until the average weight of 220 lbs. was reached.

The composition of the rations during the experiment is shown in Table I.

TABLE I.

Age of pigs in weeks	Barley groats	Wheat feeding meal	Potato flakes	Körnerblutfutter (grain and blood food)	Fish meal	Maize groats	Rye groats	Quantity given daily to each pig of group II
	Parts							lbs.
8	12	6	2	2	1	—	—	1.16
12	4	2	2	1	1	2	—	1.76
16	6	4	5	2	2	5	—	3.19
20	8	6	6	2 ½	2 ½	8	—	4.29
24	8	6	6	1	2 ½	8	2 ½	5.83
28	8	6	6	1	2 ½	8	2 ½	6.93
30	8	5	5	1	2 ½	8	2 ½	7.48

Lot I attained at the age of 28 weeks all but one day the desired average weight of 1 quintal (220 lbs.) per head; lot II reached it at the age of 30 weeks and one day.

The cost of the food for the first lot was £ 19 12*s* 3*d* and for the second £ 17 14*s* 0*d*.

The increases of weight at the different ages are given in pounds in Table II.

TABLE II.

Periods in weeks	Lot I (7 pigs)			Lot II (7 pigs)		
	Initial weight	Final weight	Increase during period	Initial weight	Final weight	Increase during period
8 to 12	216	404	188	224	334	110
12 » 16	404	641	238	334	508	174
16 » 20	641	950	309	508	746	238
20 » 24	950	1 257	307	746	104	298
24 » 28	1 257	1 540 (27 days)	283	104	1 351	307
28–30 + 1 day . . .	sold		—	1 351	1 540	189

The following figures give the results of the fattening:

Lot I

Receipts

	£	s	d
7 pigs (total weight 1540 lbs) £5 13*s* 8*d* each	39	15	8

Expenses

	£	s	d			
Purchase price of 7 pigs	9	12	1			
Cost of feeding	19	2	11			
Attendance 139 days	2	7	8			
Insurance	2	1	2	33	3	10
Net profit				£ 6	11	10
Net profit per head					18	10
Cost of production of 1 cwt of live weight				£ 2	8*s*	2*d*

Lot II.

Receipts

	£	s	d
7 pigs (1540 lbs.) at £ 5 13*s* 8*d* each	39	15	8

Expenses

	£	s	d			
Purchase price of 7 pigs	9	12	1			
Cost of feeding	17	14	0			
Attendance 154 days (1)	3	14	0			
Insurance	2	1	2	33	1	3
Net profit				£ 6	14	5
Net profit per head					19	3
Cost of production of 1 cwt. of live weight				£ 2	8*s*	0*d*

It follows from this experiment that from an economic point of view there is not much difference between the use of the automatic feeder and that of the common trough. For undermanned farms the automatic feeder might be recommended.

1271 - **The Value of Potatoes as a Principal Pig Food.** — Lehmann in *Journal für Landwirtschaft*, Vol. 61, Part 3, pp. 361-397. Berlin, July 21, 1913.

The writer enumerates the causes which have led to a change in the method of fattening pigs. He gives an account of the fattening experiments he made at the Göttingen Experiment Station with the object of finding out a paying system based on the use of potatoes as the chief ration. The pigs were given as a basal ration 2.2 lbs. of chick peas ("Gramerbsen") and 0.22 lbs. of fish meal.

The feeds for comparison, maize in experiment I, and potatoes in experiments II, III and IV, were fed in as large quantities as the animals could consume. As their need of food increased, a larger amount of the feeds to be compared was given to the pigs. A little lime was also added during the first weeks of the experiment. In experiment II the animals were allowed from the first day to eat as many potatoes as they could. In experiments III and IV, on the contrary, the potatoes were fed during the two first four-weekly periods according to the weight of the pigs. During this time, the latter were also given a little rye chaff; in experiment IV meat meal was substituted for this from the third weekly period. Experiment I was a test of corn or maize feeding, experiment II a test of rapid fattening on potatoes; in experiment III the pigs were fattened on potatoes after a preliminary period, while in experiment IV they were fattened on potatoes after a preliminary course of meat meal. The experiments fell into 4 × 2 = 8 divisions. Nos. 1,6 and 8 began with 6 and ended with 5 pigs; Nos. 2, 3 and 5 began and ended with 6 and Nos. 4 and 7 with 5 pigs. The animals were of selected native breeds and weighed as follows according to the divisions: 1 = 46.0 lbs.; 2 = 46.6 lbs.; 3 = 49.1 lbs.; 4 = 50.6 lbs.; 5 = 46.4 lbs.; 6 = 46.0 lbs.; 7 = 43.1 lbs.; 8 = 46.2 lbs.

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(1) This item is ¼ d higher per day and per head than in lot I on account of the greater amount of attendance this lot required.

The pigs were fattened until they each attained the weight of from 231 to 242 lbs., which necessitated 5 ½ four - weekly periods. The final weights and the increase in the four experiments are given in Table I.

TABLE I.

Pig			Final weight in lbs.						Increase in weight per pig lbs.
			1	2	3	4	5	6	
Experiment I	Lot	1	253.0	264.0	283.1	218.9	201.1	—	187.22
	»	2	280.5	172.5	326.0	341.7	179.3	126.3	
» II	»	3	213.0	217.1	192.3	270.4	214.3	173.8	168.08
	»	4	229.4	192.5	246.2	227.9	217.6	—	
» III	»	5	238.3	254.4	275.2	256.5	268.8	153.3	187.22
	»	6	234.7	231.0	178.6	258.9	212.3	—	
» IV	»	7	251.2	244.2	229.2	227.5	213.0	—	188.54
	»	8	171.8	231.0	265.1	245.5	238.0	—	

The animals fed on maize and those given potatoes thus developed differently; this the writer attributes to inequality in appetite.

On an average the latter were more uniform in size and larger than the former.

The weights in pounds of maize and potatoes consumed per head per day are given in Table II.

TABLE II.

	I	II	III	IV
	Maize fattening	Rapid fattening with potatoes	Potatoes (with preliminary fattening)	
			without meat meal	with meat meal
1 (Period of four weeks)	0.73	5.37	1.21	1.28
2 » » » »	0.86	5.08	1.83	1.74
3 » » » »	2.09	7.79	9.86	9.99
4 » » » »	2.86	11.07	14.54	12.23
5 » » » »	4.18	15.09	18.17	15.03
6 » » » »	5.37	16.65	21.45	18.55

In all the experiments, therefore, the pigs were able to consume more food in proportion as they became older. This increase, however, showed itself sooner in the case of the maize-fed animals and proceeded with more regularity than in that of the pigs fed on potatoes, which, as is shown by experiment II, only consumed an appreciably larger quantity of potatoes for the third four-weekly period. In experiment VI considerably fewer potatoes were eaten than in experiment III, no doubt owing to the meat meal given, which appears to diminish the power of potato consumption.

The total quantity of nutritive substances and of pure protein consumed and the increase in weight per head per day are given in pounds in Table III

Table III.

	Total of nutritive substances	Pure protein	Total increase in weight	Amount of total food used for 100 parts of increased weight
Expt. I.	3.61	0.581	1.214	296
» II.	3.63	0.451	1.091	332
» III.	3.74	0.458	1.217	308
» IV.	3.63	0.546	1.217	296

The potatoes therefore supplied the pigs fattened on them with as large an amount of total nutritive substance as maize when used as a fattening ration. The latter, however, produced more increase in weight because it has a higher pure protein content. Pigs fattened on potatoes with a preliminary period attained the same weight as those fed on maize, in spite of the lower protein content. The reason for this in experiment III was, probably, the increased power of hydrocarbon assimilation consequent upon the good fattening preparation, while in experiment IV the meat meal had produced an increase in the protein content of the potato ration.

Consequently, the latter method must be superior to the first, seeing that it entails no increase in the total amount of the food rations, but only a change in the proportion of nutritive substances. The different values of the several experiments are clearly shown by Table IV, in which the profits are worked out per pig.

	Gross Profit			Net Profit	
	£	s	d	s	d
In fattening on maize	1	7	3¾	10	5½
» rapid fattening on potatoes	1	3	7½	6	9½
» fattening on potatoes after preliminary period	1	10	8¼	13	10
» fattening on potatoes + 0.22 lbs. meatmeal after preliminary period	1	11	5¾	14	6

It is thus shown by the experiments that rapid fattening is much less profitable than the other systems of fattening with potatoes, or than fattening on maize. Fattening with potatoes with a preliminary period, during which meat meal may or may not be fed, is, however, far superior to fattening on maize. There are therefore methods of fattening with potatoes as a principal ration which are as efficacious as those based upon the use of maize.

POULTRY

1272 - **Methods of Fattening, Dressing and Marketing Poultry.** — MITCHELL, R. V. in *Monthly Bulletin of the Missouri State Board of Agriculture*, Vol. XI, No. 2, pp. 4-32. Columbia, Mo., February 1913.

The good points in a suitable table bird are: 1) a well shaped body, *i. e.* long and deep, with back and breast broad, legs short and well set apart; 2) good health; and 3) the ability to stand forced feeding in close confinement. Birds of this type should be selected from the flock and mated with similarly well-shaped male birds so as to build up a strain of reliable pedigree.

One of the most popular breeds of farm chickens is the Barred Plymouth Rock, a strong hardy bird laying as many eggs as any of the general purpose breeds. Birds with yellow skin and shanks are preferred in the best markets.

Young birds that have been allowed free range are not in good market condition but having good body frames, they respond to feeding very quickly and will gain in weight from 25 to 40 per cent. in two weeks time if properly cared for. The writer carried out experiments on different rations at the Pennsylvania Experiment Station during the fall of 1911, with the following results:

1. Birds fed on corn meal and meat scrap moistened with water gained in weight twice as much as birds fed on shelled corn and meat scraps.

2. The addition of wheat to a diet of shelled corn and meat (maize) reduced the increase in weight.

3. Birds fed on corn meal and buttermilk and kept in a fattening crate gained in weight three times as much as birds feds on corn meal alone, and this gain was made at a cost of about 3 ½*d* (7 cents) for each pound gained, whilst the cost of the gains of the birds fed on whole grain ranged from 1*s* 3*d* to 2*s* 6*d* (30 to 60 cents) for each pound gained.

These results prove that whole grain does not fatten chickens and that the best results are obtained by feeding finely ground feeds to birds confined in crates.

The writer describes a fattening crate and method of constructing it.

The birds are placed in the crate 24 hours before receiving their first feed. Food is given sparingly at first to enable the birds to stand up better under the heavy feeding to follow. They are allowed to eat as much as possible, 20 minutes usually being sufficient time. Regularity and cleanliness are essential in maintaining the birds in good condition.

The feed should be finely ground. An excellent fattening ration consists of the following:

24 lbs. of white bolted (sifted) corn meal.
6 lbs. of low-grade flour, or good-grade of wheat middlings.
4 lbs of pea meal, or finely ground hulled oats.

One pound of the dry mixture is mixed with two pounds of buttermilk to form a thin butter that will pour out of a bucket. Sour milk may take the place of butter milk, or 15 per cent. of meat scrap may be added to the mixture if water is used. No grit, green food or water should be given to crate-fattening birds and the process should not extend beyond the second week.

The writer experimented with different rations on birds fed in crates during the fall of 1910 at the poultry department of Cornell University.

The rations were made up as follows:

Pens 1 *and* 2:

24 lbs of white bolted corn meal
6 lbs. of low-grade flour
1 lb of oatmeal
1 lb. of pea meal
1 lb. of buckwheat middlings
1 lb. of wheat middlings.

Pens 3 *and* 4:

12 lbs. of white bolted corn meal
4 lbs of low-grade flour
6 lbs. of oatmeal
6 lbs. of pea meal
4 lbs. of buckwheat middlings
2 lbs. of wheat middlings.

Pens 5 *and* 6:

1 lb. of white bolted corn meal
1 lb. of low grade flour
10 lbs. of oatmeal
10 lbs. of pea meal
8 lbs. of buckwheat middlings
4 lbs. of wheat middlings.

All these rations were mixed in the buttermilk to the consistency of butter. The birds were fed three times a day (at sunrise, 11.30, and 4.30) for a fortnight. Their appetites were good, except one bird in each of pens 1 and 4 and two birds in pen 5.

The results obtained are shown in Table I.

The amount of feed consumed by the birds in each pen varied slightly. Two birds were removed from pen No. 1. during the experiment and were not reckoned in the per cent gain. The birds in pens 1 and 2 made the best gain, those in 3 and 4 the next best, and in 5 and 6 the least gain. The gains are in proportion to the amount of the rations.

The birds in pens 1 and 2 had the best appearance. They were well filled out, creamy white in colour, with the fat well distributed over the body. The birds in pens 5 and 6 had wrinkled skins and poor colour and had little fat distributed over the body. When drawn the entrails and gizard showed practically no fat.

The writer describes the methods of killing and cleaning poultry. Effective bleeding is obtained by inserting a knife into the bird's mouth on the left side of the neck and giving a downward diagonal cut which severs the two main blood vessels in the neck. By piercing the brain in the centre of the head a little behind the eyes the muscles of the skin will relax and the feathers can be pulled out easily.

For encouraging the better marketing of poultry, the writer recommends organisation of the producers to ensure better market prices and adds as an appendix a copy of the constitution and by-laws of one of these organizations, taken from *Bulletin* No. 208 of the Ontario Department of Agriculture

TABLE I — (*weight in lbs.*)

Pen	At beginning	At end of 1st week	At end of 2nd week	Before killing	Dressed	Total gain	% gain	Total of feed
1	22.9	27.9	30.3	28.75	25.75	7.4	32.4	Grain . . . . 25.7 B. Milk. 51.4
2	30.8	36.25	38.5	36.25	32.5	7.7	25.2	Grain . . . . . 26.35 B. Milk. 52.70
3	30.85	37.35	38.4	36.4	32.45	7.55	24.4	Grain . . . . . . 25.25 B. Milk. 63.12
4	31.25	37.05	39.65	37.22	33.5	8.4	26.5	Grain . . . . . . 26.6 B. Milk 66.5
5	31.0	35.75	37.95	35.32	31.1	7.0	22.5	Grain . . . . 25.6 B. Milk. 76.8
6	31.1	35.75	37.35	34.95	31.5	6.3	20.2	Grain . . . . 22.5 B. Milk. 67.5

1273 - **Results of the Season 1912-13 of the Service for the Control of Silkworm Egg Breeding in France.** — *Bulletin mensuel de l'Office de Renseignements Agricoles*, Year 12, No 7, p. 7 9 Paris, July 1913

SILKWORMS

The service of Control of Silkworm Egg Breeding created by decree of April 26, 1907, with the object of assuring the freedom of the eggs from disease (both for home use and for exportation to countries which require guarantees in this respect) has carried on its work during the season 1912-13.

Two inspectors, directors of the sericulture stations of Draguignan and Alais respectively, and eleven controllers have been employed in the work.

The number of establishments inspected was 88, and the reports show that distinct improvements have been effected as much in the selection for breeding purposes as for the quality of the cocoons.

From 497 666 lbs. of selected cocoons, 34 645 lbs. of egg swere obtained. The number of cases certified by the Service reached 537 575, containing a total of 23 893 lbs.

The number of batches of eggs sampled in the rearing establishments and examined at the stations of Draguignan and Alais totalled 2749, of which only 16 were found to be diseased .This result shows how carefully the batches attacked by pébrine had been removed by the egg-breeders and the controllers of the Service.

FISH

1274 - The Stickleback, a Source of Danger in Fish-Breeding. — Mitteil der Kgl. Bayer. Biolog. Versuchsstation für Fischerei in München, in *Allgemeine Fischerei-Zeitung*, Year 38, No. 17, pp. 441-442. Munich, September 1, 1913.

The two species of stickleback occurring in Germany, *Gasterosteus aculeatus* and *G. pungitius*, are often attacked by *Nosema anomalum*, a parasite belonging to the sporozoa. The seat of the infection is usually the exterior wall of the body, on which white tumours, often as large as peas but not malignant in character, sometimes appear in such numbers as to give the fish the appearance of being encrusted with pearls. The parasite may, however, penetrate into the internal organs, and notably the ovary, where it is no longer harmless.

According to Dr. Kunt (Norway), *Nosema* also occurs on sea-trout and plays a conspicuous part in the troubles of the Piscicultural Institute at Laerdal. Here it has been exclusively found in the ovaries of its victims. The parasite penetrates into the eggs and destroys them. In the coast region of West Sweden gudgeon (*Gobius niger*) has been attacked by *Nosema* and the egg-production of this fish has been affected. The parasite has not yet been found in artificially bred fish in Germany. The systematic destruction of the sticklebacks' nests is recommended as the best method of preventing infection.

The article contains an illustration showing a stickleback covered with *Nosema* tumours.

1275 - Contribution to the Study of Furunculosis, especially with regard to the Salmonidae. — HULSOW, KARL in *Allgemeine Fischerei-Zeitung*, Year 38, No. 10, pp. 250-253; No. 18, pp. 458-463. Munich, May 15 and September 15, 1913.

Furunculosis, which chiefly occurs among the Salmonidae, is an infectious disease caused by a specific bacterium, *Bact. salmonicida*. It is usually characterised by the presence in the muscles of furuncles containing blood and pus. These are, however, often absent, and the intestine becomes inflamed and bloody infiltrated patches make their appearance on the organs. The typical form of furunculosis is a general infection of the blood, having its origin in the intestine. The furuncles always make their first appearance after an inflammation of the intestine. Death frequently occurs before the formation of furuncles and often even previous to the appearance of the bacteria in the blood. In the latter case, the bacteria remain exclusively in the intestine. The writer gives the name of intestinal furunculosis to this form of the disease, the fatal ending of which is due without doubt to the bacterial toxins making their way into the blood. He also distinguishes a latent form of furunculosis, in which the bacteria are present in the intestine of the fish but have no effect upon its health.

It is not known why the disease appears under different forms. Perhaps there are several species, or varieties, of the bacteria, differing from one another in the effects they produce on the fish. The increased virulence of the same bacterium might, however, account for the phenomenon. The greater toxic action probably also plays a part in the varying severity of disease; thus in open waters sometimes few fish die, while on other occasions almost the whole stock is carried off. The various forms of furunculosis may also depend upon the different behaviour of the fish towards the bacteria.

This is probable from the facts that the fry are immune to the attacks of the furunculosis bacteria, and that one-year-old fish in open waters are fairly immune to the natural occurrence of the disease, and do not easily contract it when inoculated. This fact renders it probable that young fish have the power of rendering the invading bacteria innocuous, and therefore possess a certain degree of immunity against furunculosis.

For the control of the latter, the writer recommends, as a result of his investigations at the Experiment Station at Munich, the removal from the water of all dead or infected fish, when it is a case of open waters. Unless this precaution is taken the diseased fish continue to liberate spores into the water, and the dead victims, especially when they decay, form excellent breeding places for the bacteria. All implements which have been used in infected waters should after use be dipped each time in lime water, or a solution of permanganate (1 · 100 000), or else disinfected by having boiling water poured over them. If furunculosis breaks out so violently that the whole stock is in danger, it is advisable to remove all the fish from the water. The writer recommends permanganate in a solution of 1 · 100 000 for the disinfection of the breeding ponds.

The spore content of the water is first ascertained, then the required amount of the salt is dissolved in water, and poured into the pond. A pond with 62 550 spores per c.c., when thus treated by the writer, was found after one hour's time to contain only 98 spores. After 24 hours had elapsed, the number of spores per c.c. had increased to 3830, and in two days to 12 580.

The samples for counting were always taken from different depths and spots, and show that it is possible to obtain an equal distribution of the salt. This method is only suitable to use in the case of ponds from which the fish have been removed. The writer recommends a 1 : 150 000 solution of the salt for the destruction of bacteria in ponds stocked with fish. In both cases it is necessary to repeat the disinfection at 2 to 3 days' interval.

1276 – **Manuring Experiments on Fish Ponds.** NERESHEIMER in *Monatshefte für Landwirtschaft*, Year 6, Part 8, pp. 225-238. Vienna, August 1913.

The writer criticizes the experiments made by Kühnert-Preets on the manuring of fish ponds in Schleswig-Holstein (1) and refutes his results.

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(1) Published in *Fischerei-Zeitung*, Vol. 16, No. 26, pp. 323-329. Neudamm, June 29, 1913. (*Ed.*).

FARM ENGINEERING

AGRICULTURAL MACHINERY AND IMPLEMENTS

1277 - **Development and Present State of Agricultural Machinery.** — FISCHER, G. in *Zeitschrift des Vereines Deutscher Ingenieure*, Vol. 57, Nos. 30, 31 and 32, pp. 1165-1169, 1212-1218 and 1263-1268. Berlin, July 26, August 2 and 9, 1913.

The development of agricultural machinery did not arise in consequence of the demand on the part of farmers for better implements or for machinery. The first steps are almost exclusively due to the machine industry itself. Technical progress and social and economic changes induced farmers to use machines. The writer treats in his paper only of such groups of machines as deserve special mention either for their importance or for the technically successful way in which the problem set before them has been solved.

The oldest form of drilling machine was in two separate parts, the first of which was a one-horse two-wheeled chariot, which by means of shares opened six furrows; the other part which followed was the seeder, also on wheels, which was pushed by a man. A great improvement on this was the English drilling machine invented by James Cooke and unmistakeably the forerunner of modern drills. The seedbox is broad, the seeding shaft which raises the seed by means of small scoops is driven by an intermediate shaft, and the seed falls through funnel-shaped tubes into the hollow shares that open the furrows. The most recent drills differ from Cooke's in the steerable fore-carriage and in the jointed lever to which the hollow shares are fastened; thus every share can follow the inequalities of the soil, while the steering of the fore-carriage facilitates the straight running of the machine and consequently the straightness of the rows.

The writer points out the difficulties which have still to be overcome in the construction of a good drill and proceeds to discuss the development of manure spreaders. These resemble drills in some points, but present still greater difficulties as they have to deal with the most various kinds of manures. One of the simplest and oldest forms is that in which the hopper has a slit in its bottom through which a stirring shaft pushes the manure. By adjusting the breadth of the slit the quantity of manure spread can be regulated. At present the most commonly used manure spreader is the chain spreader, in which the slit is not in the bottom but in the back of the hopper, so that the manure cannot fall out by itself.

The demand for a reaping machine is very ancient. The invention of a practical reaping apparatus instead of harvesting by hand consisted in the introduction of the principle of shearing, upon which Meare's hand machine was patented in 1800. In 1807 Salmon invented a hand reaper with several scissors placed side by side so that no haulm could escape. Patrick Bell in 1826 constructed a practical machine, in which the cutter bar was situated in front of the reaper which was pushed by horses harnessed behind it; another important feature was a reel that beat the grain down against the blades and platform attached. The further improvement of the cutting apparatus was due to Americans, chiefly to Obed Hussey and

Cyrus Mc Cormick, whose works still occupy one of the foremost positions. At the same time, both in England and in America, innumerable devices were invented with the object of improving the apparatus for discharging the cut crop, among which Robinson's invention of rakes revolving around

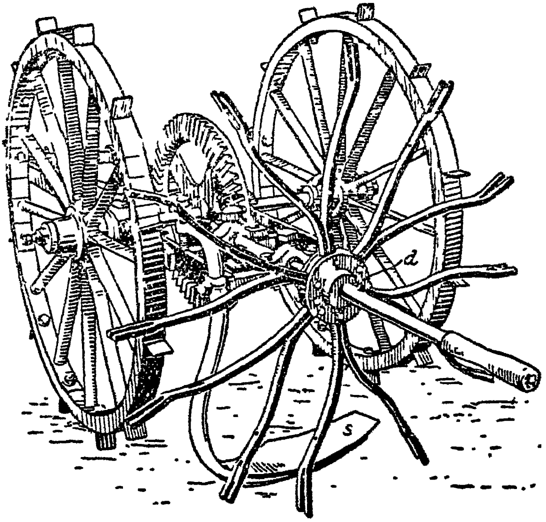


Fig. 1 — Hanson-Münster potato digger.

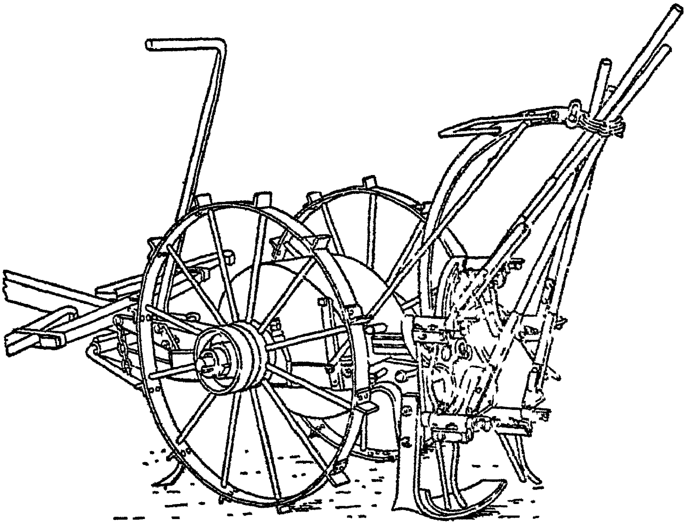


Fig. 2. — Harder's potato digger.

an inclined axis was one of the best. Shortly after these rakes were made with articulated joints and caused to revolve on a cam as at present used.

As for binders, in one of the earliest of these machines a wire was carried by a needle arm round the sheaf and then simply twisted into a knot. But binding with wire has the inconvenience of easily allowing bits of wire to remain in the straw. In recent binders the knives are as usual arranged on the shearing principle and each end of the cutter bar is provided with dividers, of which the most important one is the outside one which separates the wheat to be reaped from that still left standing.

In the development of hay rakes the only noteworthy feature is the gradual decrease of weight due to the improvement of the material with which they are made, and the greater facility of lifting the teeth by utilizing the weight of the driver.

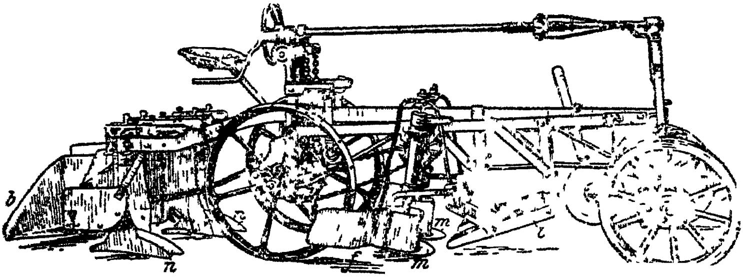


Fig. 3. — Siedersleben & Co's beetroot-lifter.

For harvesting roots and tubers the difficulties in devising were much greater than in the case of cereals. The best machines of this kind are those derived from Count Münsters' improvement of the Englishman Hanson's machine. Fig. 1 shows the Hanson Münster machine, now out of date, but from which George Harder's potato digger has been developed (Fig. 2). The forks are no longer fastened directly to the throw-wheel but by means of joints. The beet-lifter with topping apparatus, shown in Fig. 3, which works quite well under fairly difficult conditions, has been built during recent years by Siedersleben and Co of Bernburg.

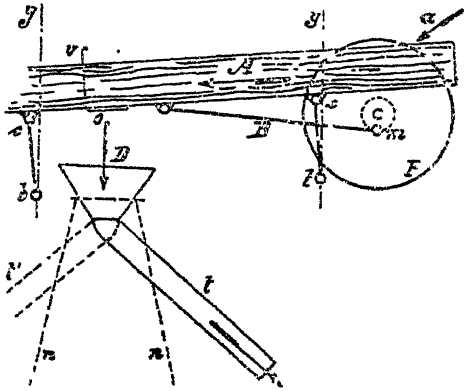
The first threshing machines were of the most varied types. Cylinders, pestles and beaters attempted to imitate the work of the flail, but only the invention of the concave with revolving drum gave a truly efficient machine. The writer describes the barred-drum threshing machine invented by Andrew Meikle in Scotland in 1786. His bars were provided with projecting teeth. In America toothed bars are generally used, while in Europe their use is limited to small machines, because they break up the straw and diminish its value. Retaining Meickle's drum, threshing machines have been much improved by the introduction of more efficient shakers, riddles, screens, etc They were soon mounted on wheels like the portable engines, so as to be easily moved as required A large up-to-date threshing machine with all the recent improvements can easily turn out 1100 to 1300 bushels of clean wheat per day. The writer describes a modern threshing outfit and gives some important details of threshers after which he reviews some straw presses

Straw presses have been used in North America since the middle of last century. In Germany the want of them was not felt till much later and only in the nineties did they begin to spread in consequence of the demand for straw for paper mills and other industries, while at the same time straw was produced in excess of the requirements of the farms

After a description and illustration of some apparatus for loading and transporting for agricultural purposes the writer considers the most discussed question in the matter of agricultural machinery, namely that of mechanical tillage, and concludes his paper by remarks on the economic importance of machinery for agriculture, industry and foreign trade.

1278 - **Transport of Grain in Granaries.** - Ringelmann, M. in *Journal d'Agriculture Pratique*, Year 77, Vol. 2, No. 38, pp. 366-368. Paris, September 18, 1913.

This simple and cheap device consists, as may be seen from the accompanying figure, of a wooden channel which can be subjected to a swinging motion.



Device for the transport of grain in granaries.

The grain which is raised by an elevator falls in (*a*) into the wooden channel which consists of a bottom and two upright sides. This channel is attached high up to the roof of the granary and runs along its whole length; it is only very slightly inclined and is supported in (*b*) on articulated frames (*bc*) which can move to and fro. The supports (*y*) are fastened to the roof beams and carry the bearings (*b*). At the upper end of the channel a long wooden connecting rod is attached, the other extremity of which is fastened to a crank which revolves by means of the pulley (*P*). In the bottom board of the channel there are several openings (*o*) closed by slides. Partitions (*v*) are used to close the channel when the slide (*o*) is opened. Under the opening a hopper (*D*) with an inclined zinc pipe (*t*) is placed to receive the grain falling through (*o*) and to lead it where required in the granary.

In the second part of his paper the writer, together with two illustrations of such a device existing at Norville (Seine-et-Oise, France) gives its dimensions, of which the following are the principal.

Length of channel	83 feet
Breadth	6.4 inches
Depth	6.4 "
Inclination	8 per 1000
Extent of swing	6 inches
Revolutions per minute	120

1279 - **Trial of a Draught Regulator for Winnowers.** — (Report of the Machine Testing Station of the Agricultural Association for Rhenish Prussia). — GIESSLER in *Deutsche Landwirtschaftliche Presse*, Year 40, No 74, p. 882 Berlin, September 13, 1913

The uniformity of speed of the draught of winnowing machines, especially those driven by hand, is only approximately attained; for this reason application of a wind regulator, which, within certain limits, almost completely does away with the effect of the inconstant number of revolutions, is to be considered as a useful improvement, all the more so as it increases the price of the winnower by only about 5 shillings.

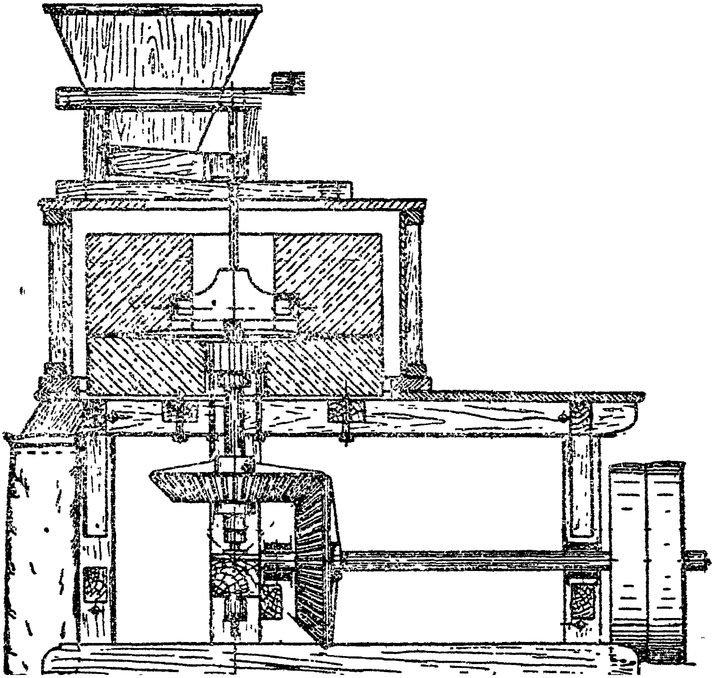
The writer, after describing the apparatus and its working, reports upon the experiments and their results, according to which the greatest deviations from the wind velocity obtained by 46 revolutions per minute were as follows:

Revolutions of crank handle per minute	A. Entrance of air completely open		B. Entrance of air partially closed	
	Wind valve always closed	Wind valve worked by regulator	Wind valve always closed	wind valve worked by regulator
from 42 to 46	0.58	0.42	0.37	0.08
from 46 to 50	0.58	0.00	0.37	0.07
Average.	0.58	0.21	0.37	0.075

The deviations in the velocity of the wind at 42 to 50 revolutions per minute can thus be reduced by the regulator by from 0.58 : 0.21 = 2.75, to 0.37 : 0.075 = 49.

1280 - **Trial of a Groat Mill.** — WOTRUBA, R. in *Maschinen Zeitung*, Year 11, No. 18, pp. 217-219 Berlin, September 15, 1913.

The mill stones of the groat mill shown in the accompanying figure are 3ft. 3 in. in diameter.



Molino triturador de muelas.

On trial the mill gave the following results:

Normal output per hour: 881 lbs.

Power required for running mill: 5.6 kilowatt per hour.

Power required for grinding 110 lbs.: 0.7 kw. per hour.

Cost of energy re uired for grinding 110 lbs. at the rate of 2.34*d* per kilowatt-hour: 1.65*d*.

Power required at the driving pulley: 8 HP.

1281 - **Milking Machines: their Sterilization and their Efficiency in producing Clean Milk.** — WING, LOIS W. in *Cornell University Agricultural Experiment Station, Circular* No. 18, pp. 65-74. Ithaca, New York, May 1913.

Milking machines are expected to deliver milk free from dirt and bacteria, but in practice this result is not possible without considerable attention to the cleaning and sterilisation of the machine

The present experiments were arranged to test: 1) the efficiency of machines in producing a high grade of milk and 2) the amount of care necessary to keep the machines in a sterile condition

The first experiments were conducted at a laboratory and a farm near Little Falls, New York, in 1911. The stable was whitewashed and had a plank floor, whilst the feeding alleys, mangers and gutter were of cement No unusual care was given in keeping the stable and cows clean. The machines used throughout the experiment were the Burrell-Lawrence- Kennedy cow-milkers.

The sterilization was carried out by various methods, using brine, alcohol, hydrogen peroxide, potassium permanganate, copper sulphate, acetic acid, and hot water as germicides. Samples of milk were taken for bacterial counts each night.

As a result of the experiments the writer concludes:

1. — Brine solution, as generally used for the treatment of rubber tubes and teat-cups, does not keep them in a sterile condition.

2. — Although the milking machine excludes external contamination to a marked degree, the milk may still have a high bacteria count owing to contamination in the tubes.

3. — The rubber tubes and teat-cups may be kept in a practically sterile condition by the use of a salt solution containing chloride of lime.

4. — The chloride of lime solution should be made fresh at frequent intervals to effect complete sterilization.

5. — If the machines are kept in a sterile condition, it is possible to obtain milk with low bacteria count.

1282 - **Trial of a Small Steam Cream-Pasteurizer.** (Report of the Dairy Institute at Proskau). — KLEIN in *Molkerei Zeitung*, Year 23, No. 31, p. 366. Berlin, August 2, 1913.

This pasteurizer is horizontal and is of very simple construction. The cylinder, which is of copper and is provided with a stirrer, measures only 7 inches in diameter and 10 ½ inches in length and is surrounded by an iron steam-jacket.

During the trial sixteen separate tests were made during which the cream to be converted into butter and containing an average of 24.1 per cent. of butter-fat was heated to about 75° C. After cooling it was acidified with Moser's pure cultures and churned. The fat content of the cream and of the buttermilk were carefully determined each time in order to ascertain the yield in butter. The same determinations were made on the samples of unpasteurized milk used as control.

The result of the trial was favourable, the pasteurizer worked satisfactorily without imparting any taste of cooked or burnt milk to the butter An average of 17 ½ gallons per hour passed through the pasteurizer The average time required to make the butter from the pasteurized cream was five minutes longer than for the unheated samples The yield in butter was 97 7 per cent for the pasteurized cream and 97 5 per cent for the other cream

On the whole this pasteurizer seems well adapted to bring the pasteurizing of cream within the reach of the smallest steam dairy

1283 - **A Handy Feed Hopper.** — OTT, E. A in *The Country Gentleman*, Vol. 78, No 37, p 341 Philadelphia, September 13, 1913

The writer describes a hopper in use at Fort Collins, Colorado, for feeding charcoal, grit-oyster shell and mash Its advantages are that it feeds the birds in two different pens without taking up extra space, is economical and easy to construct, and does not become clogged in use. Fig. 1. shows a section of the device with the boards slanting at the bottom to allow the feed to escape easily and to prevent its remaining in the centre of the device and spoiling. Fig. 2 shows the device in position and its suitability for low houses and filling with food from the outside without entering the pen

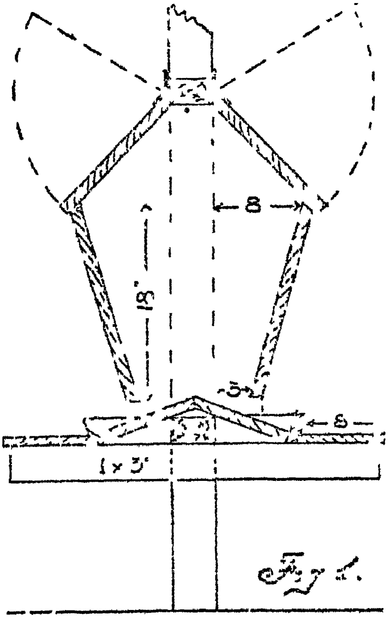


Fig. 1.

Section of hopper.

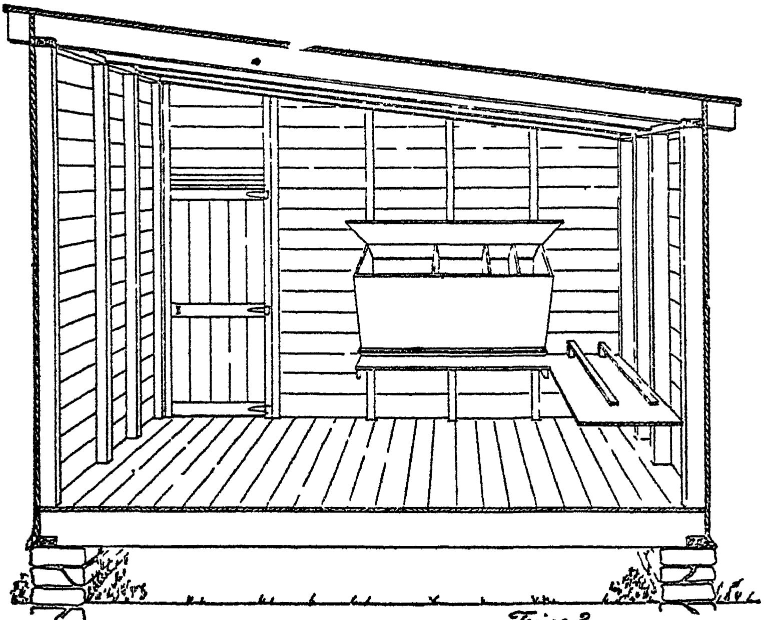


Fig. 2.

Position of hopper in fowl-house.

1284 - Review of Patents.

Tillage implements and machines.

264 196 (Germany). Apparatus for applying a subsoiler to the side of a frame plough, with differential wheel adjustment.
264 336 (Germany). Turn-wrest plough with revolving beam.
264 716 (Germany). Tractor for interchangeable agricultural implements
61 002 (Austria). Tilling machine with drum shaped implement carrier.
59 891 (Hungary). Apparatus for two-engine ploughing
60 216 (Hungary). Motor-plough.
59 806 (Hungary). Cultivator plough.
1 069 835 (United States). Reversible plough.
1 069 875 (United States). Tractor.
1 070 362 (United States) Traction-engine.
1 070 281 (United States). Cultivator
456 337 (France). Improvement in vineyard ploughs
456 670 (France). Motor spader.
456 914 (France). Improvements in ploughs with fore-carriage.
11 949 (England). Motor plough.
130 979 (Italy). Ploughing machine.
61 334 (Switzerland). Plough.
61 847 (Switzerland). Plough with apparatus for planting potatoes

Manure distributors.

264 323 (Germany). Chemical manure distributor with throw wheel.
265 651 (Germany). Cylinder manure distributor.
60 270 (Hungary). Manure distributor with sowing apparatus

Drills.

263 956 (Germany). Drill with distributing wheels in seed hopper.
59 899 (Hungary). Potato-planting machine.
1 070 898 (United States). Potato-planter.
455 956 (France). Improvements in drills.
12 058 (England). Seed drills.

Reapers and mowers.

264 717 (Germany). Automatic ungearing device for mowers.
60 998 (Austria). Mower.
1 070 055 (United States). Mowing machine.
1 069 705 (United States). Mowing attachment for motor vehicles.
457 128 (France) Improvements in mowers.
457 329 (France). Mower with reaping attachment.
11 573 (England). Mowing machines.
133 303 (Italy). Application of motors to mowers.

Machines for lifting root crops.

264 197 (Germany). Apparatus for lifting potatoes while ploughing.
60 239 (Hungary). Potato-lifting machine.
456 491 (France). Potato-lifting machine.
61 130 (Switzerland). Throw-wheel for potato-lifting machine.

Threshing and winnowing machines.

61 013 (Austria). Grain-cleaning machine.
457 419 (France). Automatic feeder for threshing machines.
12 280 (England). Threshing machine.

Other agricultural machines and implements.

264 439 (Germany). Grubber.
264 719 (Germany). Pea-sorting machine.
61 559 (Austria). Chaff cutter.
59 901 (Hungary). Root cutter.
1 070 346 (United States). Machine for cutting sugar cane.
1 070 830 (United States). Insect exterminator.
456 353 (France). Device for milking-machines.
455 983 (France). Sprayer.
12 987 (England). Elevators.
130 970 (Italy). Esiccator for rice, maize, wine pomace and the like.
133 308 (Italy). Continuous rotary press for citrus fruits.
61 628 (Switzerland). Continuous fruit press.

1285 - **A Practical Flooring for Pigsties.** (1) — MÜLLER VON BERNECK in *Mitteilungen der Vereinigung Deutscher Schweinezüchter*, Year 20, No. 18, pp. 363-365. Berlin, September 15, 1913.

BUILDING-CONSTRUCTION

The flooring for pigsties shown in the accompanying figure is but slightly sloping; it is surrounded by a small gutter which issues by the door into the main gutter. Round two sides of this flooring on which the animals lie there is a belt 16 to 20 inches wide, for their droppings, which is more inclined than the rest of the floor and is formed of ribbed cement. The inclination of this belt is 25 to 27 in 100, while that of the rest of the stall is only 2.25 in 100. The liquid excrements run off into the gutter, while the solids remain and are moved every day or every other day. The centre of the sty des not get wet and the litter keeps in good condition some days longer than in other sties, and the animals have a dry bed. The bars which are frequently placed along the walls for the protection of the suckling pigs are not required in this sty, as the sow never lies on the inclined surface. As the figure shows, the sty is part of a swine shed. It is 9ft. 1 in. by 6ft. 3 in., and is sufficient for four fattening pigs. The front abutting on the passage consists of a pivoting trough 4 feet long with an iron railing over it, and a door 2ft. 2 in. wide. The cost of building such a sty is moderate.

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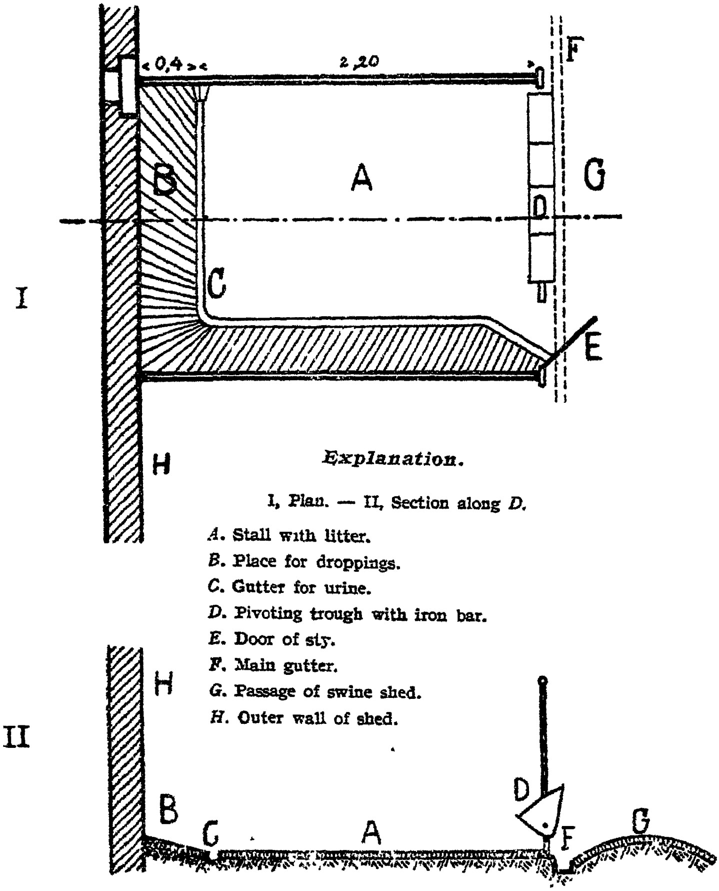
(1) See No. 405, *B*. April 1913. (*Ed*.).



Explanation.

I, Plan. — II, Section along *D*.

A. Stall with litter.
B. Place for droppings.
C. Gutter for urine.
D. Pivoting trough with iron bar.
E. Door of sty.
F. Main gutter.
G. Passage of swine shed.
H. Outer wall of shed.

Flooring for sty.

1186 - **Watering Place on Moor Pastures.** — Heisig, I. in *Zeitschrift für Moorkultur und Torfverwertung*, Year XI, Part 3, pp. 87-93. Vienna, 1913

In preparing the plan for a moor pasture the question of providing the grazing stock with a permanent supply of good fresh water is one of the first to be considered, and it may be solved by means of the springs that often arise on moors, by brooks or ponds or neighbouring lakes or by the water collected in the drainage ditches, the best way being always by a sufficient supply of running water.

If in a drainage scheme the main drainage ditch which collects also the water which formerly flowed through the moor as a small brook, traverses the moor pasture, it should be preferred to any other source for the watering place.

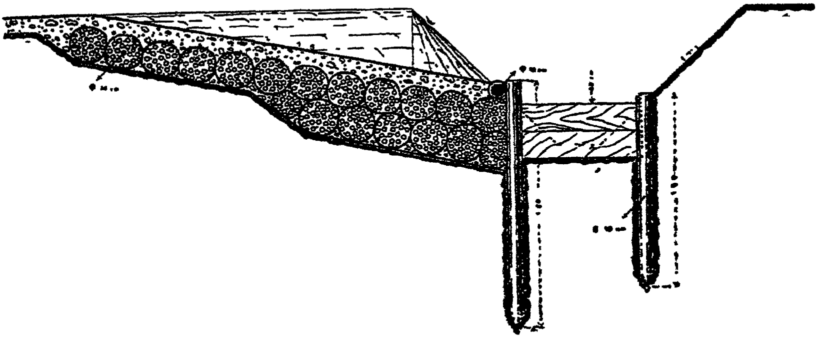


Fig. 1. — Section of watering place on secondary ditch.

This must be constructed so as to suit the special conditions of the moor soil as is shown by fig. 2, which represents the plan and section of a double watering place.

This watering place, which can be used also as a ford, is about 13 feet long. The descents to the bottom of the ditch have a slope of 1 in 5, thus affording the animals an easy and safe access to the running water. In order to prevent the treading down of the slope and the animals sinking in the moor soil, which is likely there to be especially soft, both the approaches and the bottom of the ditch are covered with 4-inch round timbers. The cost of such a double watering place, including material and labour, is about £10 10s.

If instead the drinking water is to be obtained from one of the secondary ditches which often supply sufficient and good water for the purpose, special arrangements are necessary. A simple, efficient and cheap watering place is shown in cross section in fig. 1, in which the water is held up by a small wooden weir (1).

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(1) Similar ditch watering places are discussed in *Mitteilungen des Vereins zur Förderung der Moorkultur in Deutschen Reiche*, 1911, No. 18, p. 393.

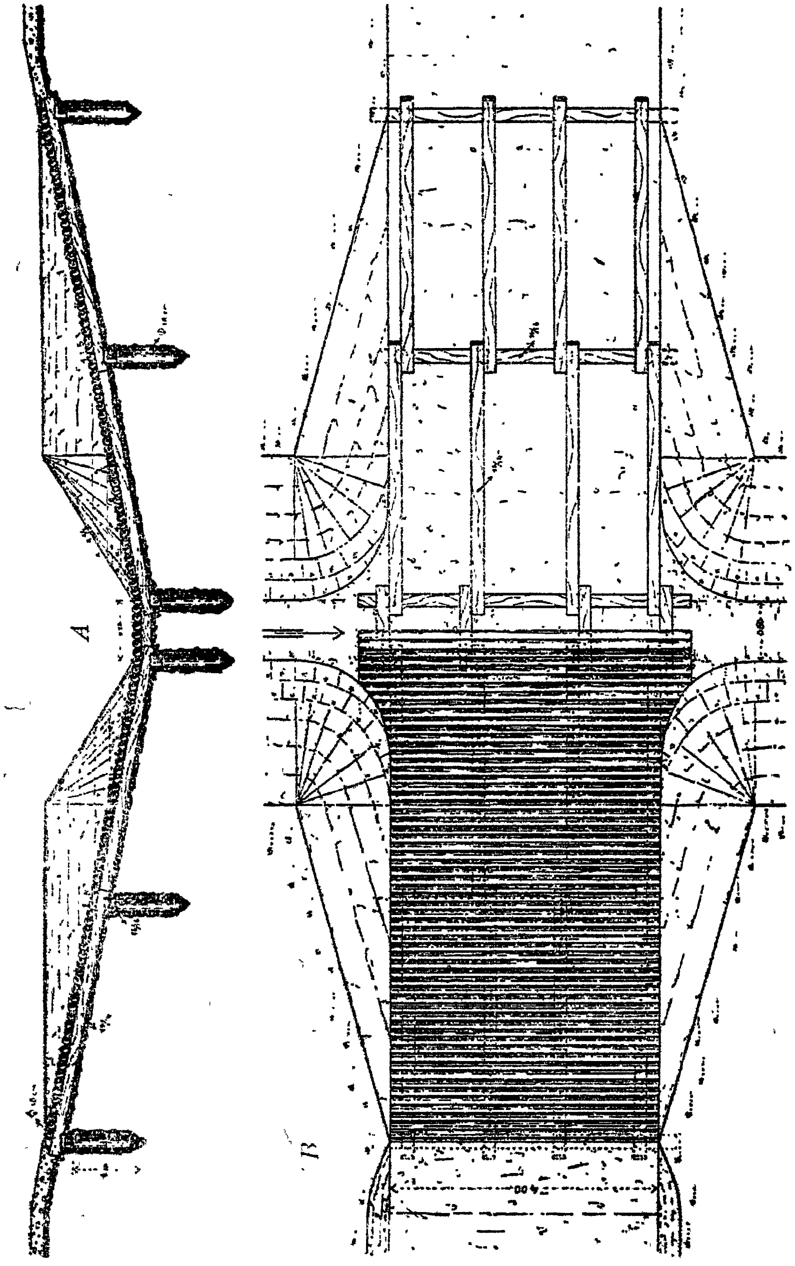

Fig. 2. — Double watering place: *A*, section; *B*, plan.

The cost of such a watering place is relatively low about £2 10*s*

If recourse must be had to spring water, a so-called "automatic waterer" is recommended; these are, however, not suitable for large herds, for which it is more advantageous to pump the water into the drinking troughs. Lastly, the writer mentions the enclosures connected with watering places and the arrangements for preventing the water being fouled

RURAL ECONOMICS.

1287 - **The Distribution of Capital in Fifty Peasant Farms in the Segeberg District in Schleswig-Holstein.** — HINRICHS in *Mitteilungen der Deutschen Landwirtschafts Gesellschaft*, Year XXVIII, Part 33, pp. 512-517 Berlin, September 13, 1913.

RURAL ECONOMICS.

The writer discusses in this paper the results of his investigations on the distribution of capital in 50 peasant farms in which the inventory of the assets was made at the same time (New Years' Day 1913) acording to the forms for peasant farms published by the Deutsche Landwirtschafts Gesellschaft under the name of "Vermögens nachweis für bäuerliche Betriebe". He gives some data on the climatic, economic and soil conditions of the district which are necessary for rightly judging the distribution of capital.

In most of the farms a light sandy soil prevails, only 13 disposing of a good loam. The very limited extension of hoed crops, the prevalence of cereals, the introduction of two or three years' grazing and of buckwheat (characteristic of the locality) into the rotation, as well as the still customary bare fallows, point to an extensive cultivation which does not require much circulating capital. The average extent of the farms examined is about 126 acres, of which an average of 86.2 per cent. is arable, 8 per cent meadow, and 5.8 per cent. permanent pasture.

Of the total fixed capital, 75.2 per cent. represents the bare land, 0.4 per cent the land improvements and 0.9 per cent the woods; while the value of the buildings amounts to 23.5 per cent. This ratio between land and buildings may be considered as fairly favourable. In some farms, however, the ratio is notably different. The greatest capital in buildings is 42.9 per cent. of the capital in land, the smallest only 11.8 per cent. On every acre of productive land there is an average capital of £10 3*s* 10*d* in buildings; in some farms this sinks to £3 19*s* 4*d* and in others it exceeds £20.

The total working capital per acre of productive area is £10 1*s* 10*d*, in which sum the cash in hand is not included. Of the above sum £6 16*s* represents the live stock, £1 10*s* 11*d* the dead stock and £1 14*s* 11*d* the implements. This working capital, which is rather small for modern conditions of farming, is an index of only a medium intensity of farming.

Of the total capital, the fixed capital is 81.4 per cent. (land 62.6, buildings 18.8) and working capital 18.6. The working capital is further subdivided as follows: live stock 67.6 per cent., machines and implements

15.2, and dead stock in kind 17.2. The ratio of percentage of these three kinds of capital to the total capital is 12.7, 2.7 and 3.2 .

The value of cattle is 59.6 per cent. (cows 41.9, other cattle 17.7) of the whole capital in live stock, thus revealing the importance of the dairy in these farms. Horses represent 20.6, pigs 19.6, and sheep 0.2 per cent of the capital in live stock.

The capital in machines and implements is, in general, not high. Out of the whole inventory capital only 18 per cent. is the share of the dead stock, as against 82 per cent. of the live stock.

The ratio between the circulating capital and the fixed working capital is as 1 : 4.8. Although the cash in hand could not be included in the account, it may be said generally that in a good many cases the peasant farmers work with too small a circulating capital. Still, a sure and definite opinion on the economic suitableness of the distribution of capital in individual farms cannot be pronounced without the aid of careful book-keeping.

1288 – **The Cost of Big Farming.** — SHOCKNEY, DON P. in *The Country Gentleman*, Vol 78, No. 37, pp. 1321-1322. Philadelphia, September 13, 1913.

The large farm owner in the South of the United States with the general system of renting in shares and with the present average crops about 20 bushels of maize or half a bale of cotton to the acre, gets no profit at all, but only losses. He rents his land in lots of 20 acres to each negro tenant family, who plant 14 acres to cotton and 6 to maize. The planter furnishes:

	$
Twenty acres of land worth $5 a year	100.00
Overseeing	60 —
Mule, its feed and care	150 —
Use of implements and harness	20 —
House rent	24 —
Fuel privileges	12 —
Pasturage for cows, pigs and ponies	24 —
Maintenance and overhead costs	40 —
Cotton seed	20 —
Seed corn	2 —
One half ginning, bagging and ties	9 —
Planter's cost, one half interest in 20-acre crop or $ 23.05 per acre	$461 —

The negro tenant furnishes:

	$
161 days common labour, cotton	161.00
21 days » » , maize	21 —
One half ginning, bagging and ties	9 —
Tenant's cost, one half interest in 20-acre crop	$191 —

The average returns are in normal years:

	$
7 bales of cotton, 525 lbs. each, at 11 cents a pound	404.25
3 ½ tons cotton seed at $ 20 a ton	70.00
120 bushels corn, at 70 cents a bushel	84.00
Total product. 20 acres	$558.25
Value of product per acre	$27.91

Cost per acre and per annum.

	Long staple cotton	Short staple cotton	Early corn cut and shredded	Late corn slip shucked	Oats and cow-peas two crops
	$	$	$	$	$
Machine tilling, and carting .	10.30	10.30	10.67	9.31	8.05
Shredding fodder			4.00		
Threshing oats					2.00
cow-peas					2.50
Baling hay or straw , ...					7.50
» shredded fodder , . . .			4.00		
Ginning cotton, short staple .		1.50			
» » long staple . .	2.00				
Hand labor, hoeing	3.00	3.00			
» » shocking maize . .			1.00		0.50
» » oats , .					
Picking cotton, short staple . .		5.40			
» » long staple . .	6.00				
Shucking corn.				1.25	
Cotton bagging and ties . . .	0.45	0.54			
Handling	0.10	0.12	1.00	0.50	1.00
Seed	2.00	1.00	0.50	0.50	2.50
Overseeing	3.00	3.00	1.80	1.50	1.50
Maintenance, fences, ditches, roads and buildings	2.00	2.00	2.00	2.00	2.00
Overhead-taxes, insurance and general expenses	2.00	2.00	2.00	2.00	2.00
Total cost per acre . . .$	30.85	28.86	26.97	16.96	20.55

The planter gets one half of this product, $ 13.95 per acre, and suffers thus a direct loss of $ 23.05 - 13.95 = $ 9.10 per acre.

According to the writer no farmer or corporation of farmers could succeed in inducing negro tenants to increase the per-acre yield to a point where the landlord's share would show a profit over and above his expense.

Plantations are exhausted by the continuous cotton growing, and the yields can only be increased by giving the land regular doses of humus and nitrogen, and these can only be produced by establishing a regular rotation and a live stock industry. But this is impossible with the present distribution of the land into small lots to the share farmers. Evidently then a farming corporation, if it wants to work at a profit, must give up the share system and have recourse to the wage system.

As a good and paying rotation the writer suggests the following: 1st year: long or short staple cotton; 2nd year: early or late maize; 3rd year: fall oats followed by cowpeas in June. He then calculates, on the basis of one dollar a day, average wages for common field work, and one dollar a day for the cost of mule work, the cost of the above crops per acre (see Table).

The average outlay per acre per annum that the planter would have to pay would be somewhat higher than under the half-share system, but in exchange he would get the whole of considerably increased crops, so that his farming would be much more profitable.

1289 – **The Cost of Wheat-farming in Victoria.** — RICHARDSON, A. E. V. in *The Pastoral Review*, Vol. XXIII, No. 8, pp. 785-786. Melbourne, August 15 1913.

The cost of growing wheat varies considerably in different parts of the State. It is lowest in the Mallee district and highest in the north-east and Goulburn Valley where the soils are extremely difficult to work.

Allowing 2*s* 6*d* for a horse and 7*s* for a man per day, the average cost of the various operations is as follows:

	Per acre		
	s d		*s d*
Ploughing	6 9	to	8 0
Three harrowings	2 3	»	2 3
Three scarifyings or cultivations	6 0	»	7 6
Drilling	2 0	»	2 0
Seed	3 0		4 0
Superphosphate	2 6	»	3 9

Since two-fifths of the wheat is sown on fallow land, interest on the land lying idle for nine to twelve months should be reckoned in the cost of cultivation of the wheat.

Harvesting is generally done by means of a harvester or a stripper and winnower and the cost comes to about 3*s* 9*d* per acre, with 2*s* or 3*s* extra for the cost of the bags according to the size of the crop. The cost of cartage to the station averages about 2*s* per acre, stacking at the station 1*d* per bag, loading on trucks ½*d* per bag, store charges ¼*d* per bushel, and stevedoring 1*s* 6*d* per ton, or ½*d* per bushel.

The average haulage of wheat for Victoria in the season 1910-11 was 174 miles, at a cost of 10*s* 9*d* per ton, or 3.49*d* per bushel; since January of last year this railage has been reduced to 9*s* 9*d* per ton, or 3.16*d* per bushel.

1290 – **The Profitableness of keeping Productive Stock,** on the basis of the results of 32 farms affiliated to the Book-keeping Office of the German Agricultural Association (Deutsche Landwirtschafts Gesellschaft), during the year 1912-1913. — GUTKNECHT, in *Mitteilungen der Deutschen LandwirtschaftsGesellschaft*, Year XXVIII, Part 35, pp. 493-498; Part 36, pp. 507-510. Berlin, August 30 and September 6, 1913.

The researches upon the profitableness of keeping productive live stock easily lead to contradictory results and to erroneous opinions when they are based on the bare figures furnished by the yearly balancing of the ledger without considering the special character of the individual farms. The formerly usual method of investigation, namely by direct calculation, is better adapted to give a correct idea of the connexion between net profit and the keeping of productive live stock, by the fact that it seeks the causes of profit or loss.

The writer consequently adopts this method in the present investigation and describes the system followed in his calculation, which comprises in the *Debit*:

1. The value of the stock as per inventory.
2. The outlay for the purchase of stock, for veterinary assistance, and for sundries as per cash book.
3. The forage as per crop book.
4. The value of the increase of stock, from the stock account.
5. The amount of labour spent upon the live stock, from the stock account.
6. From the general accounts the share of the cost of management, upkeep of buildings and implements and insurance.

On the *Credit* side:

The value of the live stock at the end of the year, to which are added the figures of the amounts received for animals sold, those of the animals or their produce taken by the owner or his household, and those of the head passed to other branches of stock breeding.

In a table which contains all the figures exerting any influence on the result, the profitableness (Rentabilität) is calculated for the individual farms, which, according to their geographical position and to their kind of farming, are divided into several groups. Of 22 farms only six show a profit on their milk cattle accounts; to obtain the net profit from these the interest of the capital invested in milch-cattle and in stabling should be subtracted. The average profit amounts to 2 ½ *d* per head and per day, the maximum being 5.2 *d* and the minimum 0.63 *d*; the loss on the other 16 farms amounts on the average to 3.3 *d*, the maximum being 8.32 *d*, and the minimum 0.68*d*. Of six farms about which only the total result of the keeping of productive stock could be calculated, three showed a loss (2.35 - 3.16 - 5.365 *d*) and three a profit (1.03 - 0.62 - 3.07 *d*), while of the seven farms in which the results of fattening cattle could be calculated separately, four closed their accounts with profit (an average of 1.8 *d* per head and per day) and three with loss (average of 3.98 *d*).

The writer then discusses the result and its causes for each farm and on this basis draws some general conclusions. The unfavourable result obtained in the majority of cases, notwithstanding the fact that the interest of the capital invested in stock and in stabling has not been calculated in the expenses, obliges one to recognise that with the present state of agricultural science and technique the necessity arises of giving up, completely or partially, the keeping of productive stock.

This verdict, however, is subject to some modification if it be considered that in the above calculations the prices of farmyard manure and of certain fodders (such as pasture grass and other green foods such as beet leaves) have been fixed without sufficiently considering that they were for wares that cannot be sold in the market; the result is that the manure is valued low and the fodders too high. The former was estimated on the basis of the prices which the plant foods are paid in artificials, and without taking into consideration that it can be replaced by lime, green manuring and fallow. The unsaleable fodders were estimated at schematic purchase prices without giving due weight to the special conditions of the farms; while with but few exceptions, the live stock is to be debited only with the effective cost of the pasture and of the green fodder and with the manurial value of the residues of the hoed crops used as fodder. It can therefore be considered that in reality the giving up of live stock would mean for many farms a diminution of net returns. This question can consequently only be resolved case by case according to the individual conditions of the farms as to climate, geological and economic condition, the losses on the trade in live stock, the special kind of farming, the division of labour and the capacity of the manager of the farm.

The keeping of live stock can be considered as an independent branch of farming which buys and sells at market prices only where actual market prices exist for all the products, as for instance in the neighbourhood of large towns. In every other case the great changes that would be caused to the whole of the farm by giving up the keeping of productive stock have to be considered. Only after having valued the unsaleable products of the soil from this point of view is it possible to ascertain by direct calculation the profitableness of keeping productive stock.

1291 – **Profitableness of Fattening Cattle in Illinois.** — KIDDER, R. L., A Cattle-Feeding Experience. — *The Breeder's Gazette*, Vol. 64, No. 10, p. 397. Chicago, September 3, 1913.

The writer bought on August 1, 1912, at the Kansas City market, 30 head of cattle weighing 24 300 lbs. They cost $ 5.65 per cwt. The commission was $12, the writer's railway fare and expenses were $ 20, freight and feed bill $ 37.22; total cost $ 1 440.

The cattle were put on good timber blue-grass pasture till October 28, when they weighed 27 600 lbs., having gained in the 83 days 110 lbs. each. The animals were then put on a 14-acre stubble-field and fed snapped corn and oat straw, and what they could get out of the stubble. The corn and hay rations were increased gradually, until by Thanksgiving (about the end of November) they were on full feed. They were now again weighed, and their weight (when left without feed or water all night) was only 27 440 lbs.

Until near Xmas the cattle were fed in the open; afterwards they were taken into the feedlot and sheds. From January 1, 1913, they received daily about ½ lb. of 50 per cent. alfalfa molasses feed, shucked corn being partially substituted for the snapped corn, and hay and straw being fed in decreasing quantities. On January 16, the total weight of the cattle was 30 760 lbs. About this time, cottonseed meal was added gradually to the ration till the amount per head per day reached 2 lbs. in the last fortnight.

On March 25 they were shipped to Chicago. They weighed 1 161 lbs. at the station of departure, and 1 128 lbs. on reaching Chicago, where they fetched $ 8.30 per cwt.

The total expenses incurred were as follows:

Price of cattle	$ 1 440.00
Corn, 1800 bushels at 43 cents	774.00
Cottonseed meal at $ 37 per ton	28.25
Molasses feed	26.25
Pasture	120.00
Salt	2.50
Hay. 3 tons at $ 12 per ton	36.00
Straw, 2 tons at $ 4 per ton	8.00
Interest on investment, at 6 per cent	58.00
Depreciation on bunks	7.00
Total	$ 2 500.00

If the cost of wages is set against the price fetched by manure and fattened hogs, the net outlay was $ 2 740, and the clear profit was $ 240, or $ 8 per head.

AGRICULTURAL INDUSTRIES.

1292 - **Investigations into the Solubility of Milk Proteins.** — LINDET, L. M. in *L'Industrie Laitière*, Year 38, No. 34, pp. 543-547; No. 35, pp. 557-561. Paris, August 24 and 31, 1913. DAIRYING.

This article is a summary of numerous investigations into the solubility of the casein and albumens present in milk. The writer is of opinion that on the coagulation of milk, a large quantity of casein, as well as albumen, passes over into the serum. The two serum proteins behave nearly alike as regards solubility in the serum elements, the formation of precipitate, the property of coagulation and of attaching themselves to the coagulated casein. The only notable difference is in the rotation angle, which is 30° in the case of the albumen and 116° in that of the casein.

With the addition to the milk of lime or phosphatic salts, a decrease takes place in the solubility of both albumen and casein alike. The cause of this is probably a decrease in the solvent present in the serum.

The following is a summary of the results of the experiments:

1. A difference exists between the soluble proteins and the decomposition products of casein in milk; the latter dissolve in such large quantities in milk that they are easily demonstrated in the serum elements.

2. From its solubility in the serum on the addition of calcium chloride, its power of attachment to the coagulated casein, and its coagulation at high temperatures, there is every reason to consider the albumen a casein. Albumen should be known therefore as casein β, to distinguish it from the other form, casein α, which is always present in larger quantities.

3. The total amount of soluble albumen and casein in milk is always nearly constant, but the amount of each present is very variable.

4. The soluble albumen and casein adhere by capillarity to the suspended casein and are more concentrated in the micellae of the latter than in the serum.

1293 – **On the Defect Known as "Knypers" in Edam Cheese.** (1) — Boekhout and Ott De Vries in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiter*, Vol. 28, Part 4-5, pp. 108-111; Vol. 38, Part 19-20, pp. 462-484. Jena, September 20, 1910, and August 9, 1913.

This defect in the cheese is characterized by one or more large cracks running obliquely across it and dividing it up into separate portions. Only the rind, as a rule, remains intact and holds the cheese together. The defect makes its appearance when the cheeses are from 12 to 14 days old, and can be detected by the full tone they give on tapping and the sinking in of the rind where the cracks occur. The latter are full of gas-bubbles consisting of varying proportions of CO_2, H and N.

The writer has ascertained by means of many isolation experiments and the examination of a large number of cheeses that the defect is due to a virulent, anaerobic, butyric-acid producing bacterium, with an optimum temperature of about 22°C., which produces spores, especially when cultivated on gelatine, and is absent from normal Edam cheese. This micro-organism can be rendered innocuous by the addition to the milk of 0.01 per cent. of potassium nitrate. If the milk is rich in ordinary Coli bacteria, the writer advises the use of a slightly stronger solution. The article contains an account of the experiments and illustrations of cheeses affected by Knypers disease.

WINE-MAKING

1294 – **Grecian Wines.** — Chassiotis (Director of Agriculture, Athens) in *La Vie agricole et rurale*, Year 2, No. 40, pp. 350-352. Paris, September 6, 1913.

Grecian wines may be classified as follows: dark red, dry white, common red, liqueur and dessert wines.

1. *Dark red wines.* — They are chiefly used in blending and are exported either as they are or mixed with thin wines. They contain considerable amounts of extract and tannic and astringent matter, and their percentage of alcohol is about 10° to 15° Gay-Lussac. The following wines belong to this class: Coumis (Eubœa) 10-11.5°; Leucadia, Saint-Maure

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(1) See p. 130, *B.* Nov. 1910. (*Ed.*).

11.5-13° ; Corfu 12-13.8°; Paros and Antiparos 11.5-12°; Nemea (Corinth) 12-14°; Santorin 12-15°; Acarnania 12-13°; Cephalonia 13.5-15°; Volos 10-12°.

2. *Dry white table wines.* — Most of these wines are used for local consumption as resined wines (1), made by adding 2 to 5 per cent. of pine resin to the must before fermentation. Those exported are not subjected to this process. The most important white wines are from Calchis, Aliveria (Eubœa) 11-12°; Salamina and Aegina (Attica) 12-13.5°; Elis and Corinth 12-14°; the plateaus of Tripolitza and Mantinia (Arcadia) 8-10°.

3. *Common red wines.* — Some of these wines are consumed locally and the rest exported. They are dry, slightly sweet and contain a high percentage of alcohol. The most important districts are Xirochovi (Eubœea); Paros, Zea (Archipelago), the Ionian Islands ; Cephalonia, which produces ; a wine (Mavrodaphne) resembling Malmsey, 13-14°; Santorin 13-13.5° ; Corinth, Achaia, Patras, Pyrgos, Calamata 11.5-12°. At Rapsani, in Thessaly, near the Olympian mountain , a wine is produced of a beautiful ruby colour, slightly tart, with a fine bouquet, 11-12°. The wines of Triccala Karditsa, in Acarnania, generally possess strength and fineness, but are often lacking in freshness.

4. *Liqueur and dessert wines.* — These are generally white wines, sometimes with a light golden tint. Their strength is almost always natural. Whenever alcohol is added only the rectified alcohol of wine is used. They are found chiefly in the islands, such as Cephalonia (muscat wine) and Santorin (vino santo).

Generally the Greek cultivator only makes a portion of his harvest into wine for his own consumption and sells the remainder in the form of must to retail wine merchants, and hotel and restaurant keepers, who make their own wines. These generally buy at about 10 frs. per hectolitre (4 1/4 *d* per gallon) and retail the wine at 40 to 50c. the litre (1*s* 5 *d* to 1*s* 10 *d* per gal.) Large establishments making wine for export are few in Greece.

During the last 20 years the exports of wine and must, sent chiefly to Italy, Germany, Austria, England, France and America have been as follows:

Average of the periods :	Hectolitres
1896–1900	240 000
1901–1905	210 000
1906–1909	280 000
1910	639 000
1911	612 759

One hectolitre = 22 gallons.

The exportation is less than one-tenth of the total production of the country ; it has increased a little during the past three years owing to the use of fresh currants following upon the various measures of foreign countries against the wines of dried grapes.

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(1) See No. 1257, *B*. April 1911. (*Ed.*)

The crisis in the wine trade which now prevails in Greece is due chiefly to the disturbance in the raisin industry, to the enormous emigration, which has depleted the country of some 200 000 peasants, representing a surplus of 400 000 hectolitres, and to the increasing popularity of beer shops in place of taverns. An other important factor is the great irregularity in the quality of the wines produced from one year to another, due partly to the ignorance of modern methods of wine-making. The following measures can be adopted for developing the industry : the popularising of better methods of wine-making, formation of co-operative cellars, direct dealings with the consumers, and exemption from duties.

Raisins. — The spread of phylloxera in France resulted in a rapid development in the production of raisins in Greece, until in 1905 it had reached the total of 150 000 to 170 000 tons from an area of 190 000 acres ; about the same quantity is produced at the present time. In 1889 France alone took 70 000 tons of raisins for wine-making, but by 1892, owing to reconstitution, the demand had fallen off, and the addition of a duty caused an intense crisis in Greece ; the excess supply soon reached 30 000 to 50 000 tons, so that the price fell from 200 frs. to 30 frs. the 1 000 lbs. To deal with this crisis, the Bank of Athens founded in 1905 a privileged society for encouraging the production of and trade in currants. This Society levies an export duty of 7 frs. per 1000 lbs, and withdraws from the market into its warehouses a certain quantity of the year's production (20 to 35 per cent). It also takes for storage any quantity of raisins or currants the producers wish to deposit ; if the grower does not withdraw them, the society takes them over at a price varying between 115 and 140 frs. per 1000 lbs. according to the quality. The society has not the right of exportation of any of the produce it has obtained, but can only make use of it for local consumption or various industrial purposes. It has also to pay a duty to the State (amounting to 4 $^1/_2$ million francs) on the dried grapes passing through its hands, and to spend a fixed sum on advertising in other countries. Further, the society must grant growers who wish to grub their vineyards an indemnity of 800 to 1 000 frs. per hectare (£13 to £16 per acre). The quantity of dried grapes generally retained by the society is about 50 000 tons per annum, the greater part of which is consumed by secondary societies in the manufacture of alcohol for strengthening liqueur wines, or for industrial purposes.

Since the foundation of the Society the extreme prices have been 115 and 200 frs. per 1000 lbs., and the average selling price is at present about 140 frs. As a result of advertising, the foreign consumption has also increased. Thus the average consumption of the United Kingdom has risen from 55 000 tons in 1900-05 to 61 000 tons for 1906-11.

PLANT DISEASES

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN

1295 - **Calcareous Chlorosis of Green Plants. The Part Played by Root Excretions in Absorbing Iron from Calcareous Soils** (1). — MAZÉ, P., RUOT, M. and LEMOIGNE, M. in *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, 2nd Half-year, Vol. 157, No. 12 (September 22, 1913), pp. 495-498. Paris, 1913.

The writers have shown that the chlorosis attributed to the presence in the soil of an excess of lime is due to the fact that the iron is rendered insoluble by the calcium carbonate (2); they also add that those plants which have thus suffered from a deficiency in iron must be incapable of dissolving its oxides through the absence of free mineral and organic acids in their root excretions.

	I gms.	II** gms.	III gms.	IV gms.	V
Calcium nitrate	1.—	0.5	0.5	0.5	The same as I diluted to one half.
Potassium phosphate (*)	0.25	—	—	0.25	
Ammonium sulphate	0.2	—	0.1	0.2	
Magnesium sulphate	0.05	0.25	0.2	0.1	
Ferrous sulphate	0.025	0.005	0.025	0.025	
Calcium chloride	0.1	—	0.1	0.1	
Potassium silicate	0.025	—	—	0.025	
Aluminium sulphate	0.025	—	—	—	
Manganese chloride	0.025	—	0.025	0.025	
Zinc chloride	traces	—	—	traces	
Spring water	1000	1000	1000	1000	
Potassium sulphate	—	0.25	0.2	—	
Calcium sulphate	—	0.25	—	—	
Tricalcic phosphate	—	0.25	0.5	—	
Sodium chloride	—	0.25	—	—	

* Reduced nearly to neutrality to phenolphthalein by the addition of potash.
** This is the solution used by E. Lambert for cultures of peas.

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(1) See No. 1206, *B.* Oct. 1913. (*Ed.*)

(2) See No. 1462, *B.* Oct. 1912. (*Ed.*)

This conclusion is supported by a series of experiments summarized in this note.

The researches were carried out on *Vicia narbonensis* (1) and the Caractacus pea. These plants were grown in an aseptic medium, with solutions of different compositions. *Vicia narbonensis* was cultivated in solution I, and the peas in solutions II, III, IV and V of the accompanying table.

With the addition of 2 per cent. of calcium carbonate, all these solutions evoked intense chlorosis in the *Vicia* and the peas; the disease also appeared in the peas growing in the control solutions without calcium carbonate. The course of the disease was identical with that followed by the writers in 1912.

It was shown by using some drops of a 0.1 per thousand solution of ferric nitrate that the decoloration was certainly again due to want of iron. Half the affected plants were then divided into two lots, and a few c. c. of one of the following solutions, *a* and *b*, were introduced into their nutritive solutions.

Solution *a*	gm.	Solution *b*	gm.
Seignette salt	0.1	Sodium citrate	0.1
Tartaric acid	0.01	Citric acid	0 01
Distilled water	1000	Distilled water	1000

The object of the organic acids is to dissolve small quantities of iron in the presence of calcium carbonate, and to allow the roots to take these up from the solution.

When this treatment was carried out, the affected plants became green in the sun in the course of two or three days according to the clearness of the sky. The *Vicia* plants gradually resumed the normal green of the controls which did not show the slightest trace of discoloration ; they resumed their activity, while the chlorotic plants which had not been treated lost their leaves and died.

The existence of the disease is signalised in the case of the roots by a pink coloration of the nutritive solution; the roots themselves assume an ochreous tint. The very slight acidification of the media by the addition of solution *a* or *b* caused the gradual disappearance of the pinkish tint, and the rootlets which grew subsequently were as white as those of the controls.

The peas gave the same results with a delay varying according to the nature of the solution in the case of the controls. The pink coloration of the nutritive solution was correlative with the evolution of the disease, disappearing on treatment as in the case of *Vicia*.

The general occurrence of the disease, even in the absence of calcium carbonate, is explained by the large amount of soluble calcium in the solutions The absorbed calcium is in part eliminated by the roots in the form of the carbonate ; thus the iron fails to come into solution exactly where it ought to be absorbed.

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(1) A South European species much resembling the field bean. (*Ed.*)

Treatment with acid solutions has caused diseased plants to become green again, even when more discoloured than the cholorotic *Vicia* plants, but the cure was not in every case effected by one treatment, the most obstimate cases requiring a second, more energetic treatment.

Of the four solutions used for growing the peas, III proved the best in retarding the appearance of the disease.

The two acid solutions added for the solution of the iron were equally efficacious.

The writers have therefore succeeded in producing at will the occurrence of calcareous chlorosis in plants, which, under natural conditions can stand fairly large doses of calcium carbonate; but the presence of soluble calcium salts and the addition of calcium carbonate place the plants under the conditions obtaining in the case of a waterlogged chalky soil of which all the insoluble components would be encrusted with lime.

The introduction into the solution of small qualities of free organic acids brings into solution minute quantities of iron and causes the disappearance of chlorosis.

The resistant plants act in the same manner; and if American vines become chlorotic in calcareous soils, this is because their root excretions are not sufficiently acid. This does not mean that the acidity of their sap is less than that of the resistant plants, but proves that the decomposition of the organic acids — the food of the plant — is more complete in the roots of species susceptible to chlorosis

A soluble ferric compound, in the presence of calcium carbonate, will always conquer the disease, provided at the same time it is able to resist chemical or microbiochemical destructive agents, a condition of affairs which it is difficult to obtain.

The best preventive treatment therefore consists in washing over the vines and the ends of the pruned canes with a solution of iron sulphate. As a remedy ferric nitrate is preferable. A solution of this compound at 0.2 per thousand sprayed onto the leaves is absorbed in a few hours, and never fails to produce rapid results.

Iron sulphate is most suitable for leguminous plants which have need of sulphur, since deficiency in the latter substance, as has already been shown by Mazé (1), also occasions intense chlorosis.

1296 – The Unfavourable Effect Produced by Various Fungicides, Insecticides and Insectifuges upon the Germination of Vine Pollen.

– GARINO-CANINA, E. Influence des traitements sur la germination du pollen des vignes. - *Annales de la Science Agronomique française et étrangère*, Year 30, No. 2, pp. 113-130, figs. I-X. Paris, August 1913.

The writer set himself the task of determining whether the fungicides, insecticides and insectifuges most commonly applied to the vine at the time of flowering have any influence upon the normal germination of its pollen, a subject concerning which there were no data either from practical experience or laboratory work.

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(1) See No. 223, *B*. Jan. 1912. (*Ed.*)

As the subject of the experiment, the very readily germinating pollen of Aramon × Rupestris Ganzin No. 1 was selected; the material came from vines under glass. This pollen, when dried on blotting paper, almost completely preserved its germinating property.

The chemicals used were as follows: cupro-ammoniacal solution, copper sulphate, copper acetate, potassium arsenate, lead arsenite, lead acetate, mercuric chloride, barium chloride, potassium permanganate, calcium hydrate, potassium sulphide, sulphur, sulphurous acid (1), acetic acid, phenol, nicotine, pyridine, soap, nicotine soap.

After several attempts, the writer found that Strasburger's solution (15 per cent. saccharose and 1.5 per cent. gelatine in distilled water) was the medium most suited to the rapid development of the pollen grain, and best adapted for the observation of its growth (especially if this solution were slightly acidified with sulphuric acid). He therefore used this compound as a control, adding to it, in turn, for purposes of experiment, varying proportions of the above-mentioned substances.

He thereby discovered that the latter exercise a more or less toxic action upon the germination of pollen grains; some entirely prevented germination (cupro-ammoniacal solution, copper sulphate, sulphur dioxide, lead acetate, copper acetate, potassium arsenate, lead arsenite, mercuric chloride, calcium hydrate, phenol, soft soap); others (powdered sulphur, barium chloride, potassium sulphide, potassium permanganate, acetic acid, nicotine, pyridine) retarded germination and caused degeneration of the pollen grain. It was further found that cupro-ammoniacal solution stronger than 0.05 per cent. hindered germination, the limit of concentration in the case of copper sulphate being also about 0.05 per cent.

Copper and other heavy metals kill the protoplasm. Pollen which had first been placed for 6 hours in a 0.75 per cent. solution of copper sulphate, then put in a filter and washed with distilled water until all the free copper was removed, was observed and compared with pollen which had been left in distilled water for the same space of time. The latter pollen grains alone germinated; those which had been submitted to the action of the sulphate remained inert in spite of the washing. Further, contrary to the generally-received opinion according to which the first sulphuring for control of powdery mildew is favourable to fertilization, the writer found in the course of his experiments *in vitro* that sulphur exercises a retarding action upon pollen germination. This is explained by the production of sulphurous acid, which is toxic to the pollen as well as to most micro-organisms. The writer intends to verify the toxic action of sulphur spraying upon the flower by means of closer and practical experiment.

In another experiment he used pollen from three different European vines, all in flower at the same time: Black Alicante, considered by growers as a vine with pollen of strong fertilizing property; Alexandrian muscat, of which the fertilization is often irregular; and Bicane, with an agglomerate pollen occurring in very thick masses and considered barren. The culture of these three pollens in the control solution with the addition in turn of copper sulphate, potassium arsenate, soft soap, precipitated sulphur and sulphur dioxide, gave the same order of results as those already obtained for Aramon × Rupestris Ganzin No. 1. It is notable that the Bicane pollen, when placed in the control medium, which was very favourable to the germination of the other pollens, showed no results, thus confirming the observations made by the vine-growers. Observed dry, Bicane pollen was clearly distinguishable by its shape from the other dry pollens examined. The writer proposes repeating his experiments on the flowers, in order to ascertain whether the above-mentioned compounds have an equally poisonous effect upon the ovary.

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(1) See No. 727, *B.* April 1912. (*Ed.*).

BACTERIAL AND FUNGOID DISEASES.

GENERALITIES

1297 - **The Influence exerted by Fumagine upon the Assimilation and Respiration of the Host Plants.** — NICOLAS, G. in *Revue générale de Botanique*, Vol. XXV, No. 297, pp. 385-396. Paris, September 15, 1913.

It is generally held that the fumagine fungi which cover the branches and particularly the leaves of certain plants with a more or less thick black coating are injurious chiefly because they hinder assimilation and respiration. This idea was not based on any precise observations, so the writer undertook experiments to test its accuracy.

Leaves covered with fumagine were divided in two, one half being freed from the fungus; the two halves, or symmetrical portions of them, were introduced into tubes containing air with 8 to 10 per cent. of carbon dioxide and saturated with moisture. The apparatus of Bonnier and Mangin was used for the analysis of the gases, and in each case two determinations were made.

From thirteen experiments with *Nerium Oleander* L., *Citrus Aurantium* L., *Olea europea* L., *Psidium aromaticum* Aubl., *Gardenia Thunbergia* L. f., *Bumelia tenax* Wild. and *Sciadophyllum ellipticum* Blume, it is clear that fumagine hinders both assimilation and respiration. The retardation of these processes depends on the thickness and density of the fungus coating.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

1298 - **Some New or Rare Plant Parasites in Italy.** — MONTEMARTINI, L. Alcune malattie nuove o rare, osservate dal Laboratorio di Patologia vegetale di Milano.— *Rivista di Patologia vegetale*, Year VI, No. 7, pp. 204-210. Pavia, September 1913.

Diseased cucumbers from the neighbourhood of Milan were found to be attacked by *Cladosporium cucumerinum* Ell. et Arth. (*C. Cucumeris* Frank); the disease had been noticed for two or three years, but it was not till 1913 that serious damage was caused; in some gardens 95 per cent. of the crop was lost. The fungus was already recorded from Italy and Germany, but not as doing damage ; in the United States, however, it has long been known as a serious pest

Septoria Iridis Massalongo was found as an undoubted parasite on young leaves of *Iris* in Rome ; it had been recorded by Massalongo only on withering leaves of *I. germanica*. The spores were larger than those described by Massalongo.

Botrytis vulgaris is recorded on camelias in a cold greenhouse at Pavia.

Cladosporium Pisi Cug. et Macch. is recorded on a white-seeded French bean at Pavia ; this is a new host, peas and broad beans being the ones previously known.

The writer records three cases of parasitism on " occasional hosts ". The first is *Fumago vagans* Pers., which spread from an oak to neighbouring brambles, blackthorns and elms. The others refer to *Cuscuta* : *C. Epithymum* Murr. was found to spread onto *Galium verticillatum* and *Plantago media* from clover, and *C. europaea* onto grasses from nettles.

1299 – **Tomato Rot.** — PAVARINO, L. in *Rivista di Patologia Vegetale*, Year VI, No. 6, pp. 161-163. Pavia, August 1913.

The micro-organism *Phytobacter lycopersicum* n. sp., isolated by Groenewege (1) in Holland in 1913 from tomatoes attacked by rot, presents the same morphological and cultural characters as *Bacterium Briosi* , which had already been isolated by the writer (2) in 1910 from material collected in Italy.

As only *Bacterium* and *Bacillus* are now recognised as genera of bacteria, the latter name must stand.

1300 – ***Gloeosporium Darlingtoniae* Parasitic on *Darlingtonia californica*, an Ornamental Plant.** — KLEBAHN, H. Beiträge zur Kenntnis der Fungi imperfecti, II. — *Mycologisches Centralblatt*, Vol. III, Part 3, pp. 97-115, figs. 16-33. Jena, September 1913.

The specimens of *Darlingtonia californica* Torr. growing in the Botanic Gardens at Hamburg were attacked during the course of the summer of 1904 by a disease characterised externally by the green tissues turning brown, and which destroyed several plants in a short space of time. Microscopic examination having revealed the presence of mycelium in the discoloured tissue and of conidia on the surface of the affected portions, it seemed probable that a fungus was the source of the trouble. Infection experiments carried out in September 1905 gave positive results. Wishing to repeat these experiments during the autumn of 1912, the writer scarcely found two affected plants ; the fungus developed late, infection was light and the disease spread little. Perhaps this was attributable to the advanced period of the year at which the experiments were carried out, but it is equally possible that between 1905 and 1912 the fungus had become less virulent or the host plant more resistant.

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(1) See No. 613, *B*. May 1913. (*Ed.*).

(2) See No. 1544, *B*. May 1911 (*Ed.*).

After giving the results of anatomical investigation upon a portion of the material which had been artificially infected, and of his observations upon pure cultures of the fungus, the writer states that the parasite of *Darlingtonia* already entitled by Potebnia *Discula Darlingtoniae* is a new species of *Gloeosporium*, to which he has given the name of *G. Darlingtoniae*. The writer discusses the question of the value of Von Thümen's *Discella Darlingtoniae*, which seems to be based on a fungus occurring on some other tree.

The writer describes in another chapter a *Pestalozzia* which he found, as well as the *Gloeosporium*, on the dead portions of diseased plants of *Darlingtonia californica* In microtome sections, another conidial form was found together with the *Pestalozzia* It is unlikely that this belongs to the development cycle of the *Pestalozzia*, so that it may be connected with *Gloeosporium Darlingtoniae*.

Pestalozzia must be regarded as essentially saprophytic. The infection experiments on *Darlingtonia* always gave negative results. In pure cultures, free conidia were not obtained at first, but there occurred upon a stroma a great development of fructiferous bodies (true pycnidia), which contained the characteristic *Pestalozzia* conidia. On continuing the researches, the formation of free conidia on the substratum was subsquently obtained.

The appearance in the cultures of true pycnidia, and especially the fact that the fructiferous bodies which are formed under natural conditions upon the substratum are true pycnidia with a pseudoparenchymatous investment, shows that the genus *Pestalozzia* is wrongly placed among the *Melanconiaceae*. It would be better referred to the *Sphaeropsideae* (*Sphaerioideae, Phaeophragmiae*), and placed near the genus *Hendersonia*. The *Pestalozzia* found on the *Darlingtonia* belongs to the morphological type of *P. versicolor* Spegazz. but owing to some of its characters, a special place has been assigned to it.

1301 – **The Results of the Control of the American Gooseberry Mildew *(Spaerotheca mors-uvae)* in Russia.** — DE JACZEWSKI, A. Quelques mots sur le traitement de *Sphaerotheca mors-uvae*. — *La Revue de Phytopathologie appliquée*, Vol. I, No. 6-7, pp. 87-88. Paris, August 20-September 5, 1913.

In Russia, this disease began to attack the gooseberry bushes at the beginning of the century, but it appears that the fungus was introduced from America into the Southern provinces towards 1890. The Institute of Phytopathology at St. Petersburg has devised the following system of control, which is based on a long and varied series of experiments (1), and is most efficacious if properly carried out:

1. — In autumn, when the leaves fall, the ground round the bushes should be thoroughly dug over, in order to bury as deeply as possible the dead leaves and the berries bearing the mycelium and perithecia of the fungus.

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(1) See No. 2021, *B.* June 1911; No. 722, *B.* April 1912. (*Ed.*).

2. — The branches, and the soil beneath the bushes, must be well sprayed with a solution of sulphate of iron (30 gms. per litre, or 3 lbs. in 10 gallons).

3. — In spring, before the buds break, the bushes should be pruned by removing all thickly-growing branches which hinder the penetration of light and air; care being taken to prop up any branches which touch the ground; after this, the spraying should be repeated as in autumn

4. — As soon as the young leaves have made their appearance, spraying must be begun; the best compounds for this purpose will be mentioned later. If the treatment is preventive, three or four sprayings at 15 or 18 days' interval are all that is required; but if the disease becomes rife, as it has done in Russia, much more frequent spraying (every 10 or 12 days) is necessary until the berries turn colour; after the gooseberries are gathered, it is well to spray once or twice more; the young shoots especially should be treated, as at this time they are most liable to be attacked by the fungus.

As for the fungicides for summer spraying, a Bordeaux mixture at 1 or 2 per cent (1) and copper salts in general, have merely a preventive effect. Before the appearance of the disease, it is possible by means of very careful spraying with copper salts to arrest the development of the parasite, but if the fungus is fully developed, Bordeaux mixture has no effect, very likely because the thick felt of the oidium does not permit of the penetration of the copper salt. Only one compound with a copper base has been found equal to the sprays to be mentioned: this is azurine (copper sulphate and ammonia) at 3 gms. per litre (3 lbs. in 100 gallons); it has given excellent results, without scorching or harming the leaves, but its price is relatively high.

On the other hand, the experiments made at the Institute have shown that sulphur (2) usually brings about the fall of almost all the leaves. For the same reason, mixtures of sulphur and quicklime are not suitable to the case in question; 1 per cent., and even ½ per cent., lime-sulphur washes (3) bring off most of the leaves. Amongst the other sulphur compounds, those which have given the best results practically everywhere in Russia during the last few years are alkaline polysulphides; it is true that they cause some leaf-fall, but by using only 2 or 3 gms. per litre (2 or 3 lbs. per 100 gallons), and spraying only in the evening or early morning, as well as by accustoming the leaves to sulphur when they are quite young, the damage due to scorching and leaf-fall can be avoided. The susceptibility to injury from these sprays varies according to the varieties and certain hardy ones are not at all affected by the application of polysulphides.

M. Doroguine, the Assistant at the Institute, has for nearly two years been occupied in testing various alkaline compounds. He has found that ordinary commercial soda (3 gms per litre or 3 lbs per 100 gallons) is no less efficacious than polysulphides and azurine and costs much less. The only defect of this solution is that it does not adhere sufficiently to the leaves and is easily washed off by rain, which necessitates spraying at frequent intervals, in the case of a severe attack every 8 or 10 days. To obviate this difficulty, however, it is only necessary to add to every 2 or 3 gallons a handful of flour, or a spoonful of treacle. Perhaps great adhesive power could more easily be obtained with soap emulsion or the addition of gelatine. Caustic potash in the same proportions seems to have an effect similar to that of soda.

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(1) See p. 163, *B.* Nov. 1910; No 856. *B.* May 1912. (*Ed.*).

(2) See p. 163, *B.* Nov. 1910 (*Ed.*).

(3) See No. 856, *B.* May 1912; No. 884, *B.* July 1913. (*Ed.*).

Sphaerotheca mors-uvae often attacks currants particularly black in Russia ; but it seems that as in the case of the *Uredineae*, there are biological races of the parasite, since in plantations consisting of different species of *Ribes*, one is attacked while the others are immune. Varieties of the same species also differ in their predisposition to the disease.

1302 – **Bacteria isolated from European and American Vines Affected by "Bramble-leaf".** — FAVARINO, L. Ricerche sul Roncet. — ID. Ulteriori ricerche sul Roncet. — *Rivista di Patologia Vegetale*, Year VI, No. 6 (August 1913), pp. 164-170 and No. 7 (September 1913), pp. 193-203. Pavia, 1913.

The writer has been occupied in investigating the abundant material received from Sicily and other parts of Italy in order to ascertain whether any bacterial or fungoid parasite exists, which, by its constant presence, lends any support to the opinion of those investigators (Viala, Briosi, Pichi, Delacroix and others) who consider "bramble-leaf" ("roncet" in French) a parasitic disease.

He introduced portions of diseased vines (stems, branches and shoots) into different nutritive media after having previously carefully disinfected them and obtained the development, in cultures which were originally pure, of some micro-organisms mostly of a bacillus type; he describes their morphological and cultural characters.

From a specimen of Rupestris du Lot affected with typical "bramble-leaf", received from Palermo, three micro-organisms were isolated; one seemed identical with *Bacillus Baccarinii* Macch. (*B. vitivorus* Bacc.) and is the cause of the vine disease known in Italy as the "mal nero". He also isolated a fourth micro-organism from other specimens of Rupestris du Lot from Noto (Sicily). The Rupestris from the nurseries at Vittoria (Sicily) alone produced no pure cultures, owing to their remaining contaminated. Finally, from young wild plants of Riparia × Rupestris sent from Voghera (Prov. of Pavia), two micro-organisms of similar character, and therefore to be referred to the same species, were obtained. No cultures were obtained from rooted shoots on which Barbera was grafted, also sent from Voghera.

In the case of *Bacillus Baccarinii*, it must be assumed, until proof is found to the contrary that it can, under certain conditions, also become the cause of "bramble-leaf", if this disease, which is difficult to identify, is considered to be a form of "mal nero" with more or less grave symptoms according to the resistance of the vine. It may be that these bacteria are saprophytes, which, under exceptional circumstances, become pathogenic. According to the researches of Meissner, Zahn Hausen, Buchner, Lehmann and others, the healthy tissues of animals and plants do not contain bacteria capable of development It may, however, be a question of non-pathogenic organisms occurring at the same time as the " active " parasite, or subsequently to the latter, as is suggested by the last researches of E. F. Smith. In any case only experiments on artificial infection, which will be made in the course of time can determine the " bramble-leaf " micro-organisms and decide whether those with which we have just dealt are among them, and whether in addition to the specific and active micro-organism. other non-pathogenic species occur at the same time.

1303 - ***Bacillus Vitis*, a new Schizomycete, Parasitic on American Vines in Liguria.** — MONTEMARTINI, L. Un nuovo Schizomicete della vite. — *Rivista di Patologia Vegetale*, Year VI, No. 6, pp 171-176. Pavia, August 1913.

The Government Nursery of American vines at Ventimiglia (Liguria) was established about twenty years ago near the river Roia upon a pebbly, light and arid subsoil; it is irrigated intermittently and badly manured with the sweepings of the town Five years ago, some vine growing there were in a serious condition which increased with time, and ended in the death of the plants. The disease spread, and destroyed a large part of the nursery. The Rupestris were the most affected; the Aramon × Rupestris also suffered, while the various Riparia hybrids proved immune.

During the first years of the attack, special cultural operations were carried out round the diseased vines, the latter being plentifully manured. The vines which were substituted for the diseased plants were able to grow, and scions grafted on shoots taken from the diseased vines have done well up to the present. The distribution of the disease in the nursery has always been irregular. The diseased vines occur chiefly in the interior of the plots; those on the outside having more air and light appear to be still healthy.

At first, the disease presented the characters of a general weakening of the vegetative growth of the plants (production of small feeble shoots, with the formation of suckers). It is only of late years that the most seriously affected vines have showed symptoms of " bramble-leaf ".

The writer observed in the case of the withering vines which he collected and studied in 1911, that transverse sections of the vine wood and largest roots showed blackish patches of irregular shape and distribution occurring singly or together in a section, with indefinite boundaries, and varying in diameter from some millimeters to half a centimeter. The existence of these patches, and the fact that in the same places the vessels were obstructed by tyloses, or by masses of viscous substance, aroused the suspicion of the presence of a gummosis of bacillus origin, and caused the writer to search the wood of the infected vines for some definite micro-organism. The bacillus which had been isolated in 1911, was again isolated in 1913 by Prof. Pavarino from the organs of other vines (also from the green parts) from the same nursery in a more advanced stage of the disease.

The fact of having found this bacillus after an interval of two years, and upon a certain number of plants, and that it possessed constant morphological and cultural characters, makes it probable that this micro-organism is of some importance in the etiology of the disease and led the writer, when giving a complete description of the bacillus, to propose for it the provisional name of *Bacillus Vitis*. The latter differs as much from *B. Baccarinii* Macch. (*B. vitivorus* Bacc.), found in the wood of vines suffering from "mal nero", as from the forms of Schizomycetes isolated by Naso from vines affected by the same disease. Neither has it been possible to identify it with any of the polymorphic, and sometimes entirely saprophytic, micro-organisms occurring so frequently upon plants. Only inoculation experiments can decide if *B. Vitis* is really pathogenic, and the cause of the destruction of the vines in the nursery. For the moment, all that can be said is that the above-described disease presents the phenomenon of rachitis accompanied (either as primary or secondary cause) by an alteration of the wood, with the formation of gum and the presence of a special Schizomycete. This " rachitism " is very similar to " brambleleaf ", so that it is possible that the disease commonly known by the latter name is not an affection always due to the same cause, but is rather a symptom attributable to a variety of agencies (parasitic, climatic or edaphic).

1304 – **The "Rote Brenner" *(Pseudopeziza tracheiphila)* of the Vine.** (1)
MÜLLER-THURGAU, HERMANN Der rote Brenner des Weinstockes. II. Theil. — *Centralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten.*, Part II, Vol 38, Nos. 21-25, pp. 586-621 1 plate Jena, September 20, 1913.

In an article in the same journal for 1903 the writer stated that *Pseudopeziza tracheiphila* was the cause of this vine disease, which had formerly been attributed to atmospheric agency. As some investigators still denied the parasitic nature of the affection, Hr. Muller-Thurgau carried out further researches which confirmed those he had previously made. He succeeded in growing the fungus upon vine leaves killed artificially; he also observed the manner in which it passes the winter upon the fallen leaves of the previous year; and he has been able to reproduce the disease on living leaves. The infection depends upon the age and the water content of the leaves.

The writer recommends for the control of the parasite, the improvement of the physical constitution of the soil and of the state of nutrition of the plants the planting of resistant vines, and spraying the young leaves with Bordeaux mixture, etc

1305 – **Two Fungi as Causal Agents in Gummosis of Lemon Trees in California *(Botrytis vulgaris* and *Pythiacystis citrophthora).*** — FAWCETT, H S. in *The Monthly Bulletin of State Commission of Horticulture*, Vol. II. No. 8, pp. 601-617 + 12 figs. Sacramento, California, August 1913

The term " gummosis " expresses the result of the disease rather than the actual disease itself. It is characterised by dying areas of bark accompanied by exudation of gum. It has been shown to be due to the presence of one or other of two fungi, commonly known in packing houses as brown rot fungus (*Pythiacystis citrophthora*) and grey fungus (*Botrytis vulgaris*) respectively.

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(1) See also No. 877, *B.* July 1913. *(Ed.)*

Various physiological explanations have been given for this disease, owing to the failure of attempts to induce it by inoculation. Later experiments have shown that inoculation is successful only when the diseased material is obtained from the advancing edges of diseased areas. The tissues already permeated with gum in the diseased areas always failed to induce the disease when transplanted to healthy bark. The two types of the disease are as follows.

1. Grey Fungus (*Botrytis vulgaris*). — In attacks of this fungus the outer layer of bark is killed much in advance of the inner, in which there is some softening of the bark. Pure cultures of this fungus were obtained and successful inoculations produced. In bad attacks of the fungus in moist weather, raised cushion-like patches of grey spore-covered bodies appeared on the surface. It was found that neats-foot oil applied to the inoculated wounds encouraged the fungus and exaggerated its effects.

2. Brown Rot (*Pythiacystis citrophthora*). — This is the most common form of gummosis. The bark remains hard from the beginning and is killed slowly through to the wood without any evidence of fungus growth. Pure cultures were obtained and the fungus proved to be the cause of this form of gummosis. Neats-foot oil appeared to be without effect on this form of the disease.

The brown rot fungus is known to live in the soil, and this explains why flooding the trunk of the tree or burying the bud union below the soil, is favourable to the development of the disease. Young trees are more resistant to the disease than old ones and inoculations on various citrus trees have shown that the lemon is most susceptible, the sweet orange next and sour orange least of all. This explains why sour orange trees are least subject to attacks of gummosis under unfavourable orchard conditions, and also why lemons cannot be well grown on their own roots in California.

Treatment. — Bordeaux paste has been found most effective, made as follows: 1 lb. blue stone (copper sulphate) disolved in 1 gallon of water in a wooden vessel; 2 lbs. of unslaked lime, slaked in about gallon of water. Stir together when cool and apply with a brush. It should always be used fresh. Cutting out the diseased bark is necessary before applying the paste and care should be taken to remove the edges of the diseased area. Gum may exude after applying the paste, indicating that infested bark exists outside the treated area. If the infected area is considerable it may be more desirable to isolate it by removing strips of bark only and applying the paste to the edges to prevent spreading of the disease.

INSECT PESTS.

MEANS OF PREVENTION AND CONTROL

1306 - **The Froghopper Egg Parasite (*Oligosita giraulti* Crawford) and its Colonisation in the Cane Fields.** — URICH, F. W. in *Board of Agriculture, Trinidad and Tobago. Circular* No. 11, pp. 5-9. Port-of Spain, Trinidad, August [illegible], 1913

This parasite on the eggs of froghoppers in cane fields has been determined by Crawford as *Oligosita giraulti*. It has been bred from the grass from numerous sugar cane estates.

Life History. — It is an extremely active insect and runs over dead cane and grass leaves very rapidly. It locates the eggs of froghoppers in dried tissues and after a thorough examination lays its eggs inside them.

Oviposition takes from 4 to 30 minutes according to the state of the eggs. A certain stage in the development of the froghopper egg is found to be more favourable to the development of the parasite. This was found by experiment to be when the hatching-lid of the froghopper egg was well formed and black in colour. The parasite failed to develop on the eggs of the host if they were young or newly laid. The period of development of the parasite to the perfect insect is from 22 to 41 days.

During the development of the embryo the normal froghopper egg remains quite white; but when parasitized it changes colour after 5 to 7 days, becoming grey and then quite black. In such eggs the red coloration of the parasite can be made out a day or two before emergence by viewing the egg by transmitted light.

The adult parasite measures about 0.5 mm. and appears to be always searching for froghopper eggs, passing from one piece of grass to another by short leaps. Up to the present no males have been observed, and females kept in confinement reproduce parthenogenetically with an average of 8 offspring.

Since the eggs of the host require more moisture for development than the parasite, it is possible for two generations of the latter to attack the same batch of froghopper eggs, and as a female parasite is ready to lay her eggs within an hour after emergence, the multiplication of the froghopper is seriously checked. The percentage of parasitism works out at about 16 to 25.

With a view to increasing the extent of this parasitism, the artificial breeding of the parasites and their liberation in the cane fields has been recommended. This method is rather slow and it is found to be much more expedient to transfer cartloads of the grass infested with parasites to the cane fields. By this method it is hoped that colonies of the parasite may be established in the cane fields and the froghopper kept in check.

INSECTS INJURIOUS TO VARIOUS CROPS

1307 - **A Billbug Injurious to Small Grain: *Sphenophorus discolor.*** — SMITH, H. S. in *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, pp. 619-621, figs. Sacramento, California, August 1913.

Species of *Sphenophorus* have been known to attack corn (maize) and sugar cane and become serious pests in some parts of the United States, but were not recorded as attacking small grain in California until quite recently, when considerable damage was being done to the experimental plots of wheat, barley and oats. The beetles attack the stem of the ears and sever it within the sheath. The ear turns white and fails to develop grains. No larvae or purpae have been observed yet and it is thought that this insect has bred from the growth of tule or bullrush (*Scirpus lacustris*), from which this land has been but recently reclaimed. Careful destruction of these rushes is therefore recommended in reclaiming this type of land.

1308 - **Larvae of *Gortyna ochracea* and *Vanessa (Pyrameis) Cardui* attacking Artichokes in France.** (1) — BOURILLY, A. Note sur deux lépidoptères des artichauts. — *Journal d'Agriculture pratique*, 1913, Vol. II, No. 38, pp. 373-374. Paris, September 18, 1913. — TSCHAËN, E. La Noctuelle de l'Artichaut (*Gortyna ochracea* Hübner). — *La Revue de Phytopathologie appliqueé*, Vol. I. No. 3, p. 107-108, fig. 1-2. Paris, September 20, 1913. — VIDAL, E. Deux Ennemis de l'Artichaut. — *La Petite Revue Agricole et Horticole*, Year 19, No. 451, p. 211. Antibes, September 23, 1913.

In the spring of 1913 the artichokes in the neighbourhood of Hyères were severely attacked by the caterpillars of two Lepidoptera.

One of these is *Gortyna ochracea* (" Frosted Orange " moth); Tschaën records the examples in question as G. *ochracea* var. *xanthenes* Germar (= var. *cinerea* Gooss ns), while Vidal considers it a distinct species and names it *Hydroecia xanthenes* Germ. All three writers refer to the serious damage done by these larvae. which bore into the stems and heads. and sometimes also attack the heads from outside.

So far, the most effective treatment appears to be cutting off and burning the affected stalks. Tschaën advises burning the whole plant after the crop is gathered, to destroy the larvae and pupae it harbours. As this species attacks many wild plants, Bourilly and Tschaën recommend the clearing away of all weeds near the artichoke beds.

The caterpillars of the Painted Lady (*Pyrameis cardui*) damage the crop by destroying the leaf tissue. Vidal considers that the only good means of dealing with them is to pick off and burn the leaves as they are attacked. All the chrysalides of *Pyrameis cardui* sent to the Natural History Museum in Paris during 1913 were found to be parisitized by Chalcids of two different genera.

1309 - ***Cladius (Priophorus) padi* attacking Strawberries in France.** — VUILLET, A. Un ennemi du fraisier. — *La Revue de Phytopathologie appliquée*, Vol. I, No. 6-7, pp. 97-98. Paris, August 20-September 5, 1913.

In June 1913, two hymenopterous larvae (fam. *Tenthredinidae*), which had been damaging a strawberry bed, were sent from Bressuire (Deux-Sèvres) to the Paris Entomological Station. The writer was able to ascertain by breeding that they were the larvae of *Cladius* (*Priophorus*) *padi* L., an insect of wide distribution in Europe, where it lives at the expense of a large number of different species of plants. Although it appeared not to have been recorded before as occurring on the strawberry, its presence on this plant is not surprising, all the more as it has a strong predilection for Rosaceae (hawthorn, wild rose, pear, plum, etc.). After having briefly described the different stages of development of this insect, the writer mentions as natural enemies of the larva, *Tryphon lucidulus* Hart and *Ichneutes reunitor* Nees.

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(1) See No. 1224, *B*. Oct. 1913. (*Ed*.).

As means of controlling the pest, spraying with nicotine or arsenical compounds is to be recommended, care should always be taken to treat the lower surface of the leaves. Since strawberries should not be sprayed after the fruits are formed, it is best to apply the preventive treatment before flowering. When the crop is gathered it is an easy matter to destroy the last generations of the insect.

1310 - ***Serica anthracina* Lec., a Scarabaeid, defoliating Orchards in California.** — ESSIG, E. O. The Manzanita Serica. — *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, pp. 622-623, + 1 fig. Sacramento, California, August 1913.

An orchard of prune and apple trees in El Dorado County was considerably defoliated during April and May. The writer found this beetle (fam. Scarabaeidae) at work and noticed that the attack was worst round the boundary of the orchard. He was therefore led to discover the insect in wild shubbery adjoining. It was found to be particularly abundant on Manzanita (*Arctostaphyllos* sp.) and also occurred on black oak, lupins and *Ceanothus* sp. The beetle varies from light brown to almost black in colour and is less than half an inch long. Owing to its timidity it is exceedingly difficult to find on the leaves.

The remedy recommended consists of 8 lbs. lead arsenate, 8 lbs. lime to 100 gallons of water. This should be sprayed early and the tender shoots liberally drenched with it.

1311 – **The Peruvian Fruit-Fly *(Anastrepha peruviana* N. Sp.).** — TOWNSEND, CHARLES H. T., in *The Journal of Economic Entomology*, Vol. 6, No. 4. Concord, N. H., August 1913.

The Peruvian coast region has long been known to be infected with the fruit-fly. a pest which attacks citrus as well as deciduous fruits, particularly during the month of February.

In February 1912 a guava tree at Sullana in the Chira valley, Peru, was completely infested by Trypetid maggots, and the fly was to be seen among the fruits at the same time. The writer reared numbers of these maggots, and flies were produced from the 4th to the 10th of March. This same tree having shed all its diseased fruits during February, produced a second crop in March, which contained only one infested fruit containing one small maggot, thus indicating the distinctness of generations.

As the insect does not appear to have been identified before, the writer describes it under the name of *Anastrepha peruviana*, and mentions the characters which distinguish it from the closely allied species *A. fratercula*.

As a remedy he recommends spraying the foliage before the fruits begin to ripen, or as soon as the presence of the flies is noted, with the following mixture : lead arsenate 5 to 10 lbs., chancaca (brown or black cane-sugar in cakes) 25 to 50 lbs., and water 100 gallons. The chancaca must be dissolved in boiling water before adding to the arsenate solution. Variation in the amount of arsenate added is required for different kinds of foliage, guava and orange standing much more than peach, and the sugar content should vary in the same proportion.

1312 – **Insects injurious to Olives: *Saissetia oleae (= Lecanium oleae), Zeuzera pyrina (= Z. aesculi), Prays oleaellus, Euphyllura olivina (= Psylla oleae)* and *Hylesinus oleiperda*,** — DEL GUERCIO, GIACOMO Nuova contribuzione alla conoscenza dei nemici dell'Olivo — *Redia*, Vol IX, Part I, pp. 59-75 Florence, August 28, 1913.

1. — It is well known that the eggs of the black scale of olives (*Saissetia oleae = Lecanium oleae*) hatch out in large numbers from the 10th to the 20th of June, and that quantities of larvae are to be found on the leaves and branches. This period is therefore considered to be the most favourable time for the destruction of the insect. However, in 1912, according to the writer's observations in Apulia, hatching of these eggs continued from the beginning of June until the middle of August, or about 65 to 70 days. A fact intimately connected with the preceding is the emission of excremental liquids ejected to considerable distances by the females of *Saissetia* and of juices caused by the repeated punctures of the insects; the quantities of these are responsible for the appearance and spread of fumagine, as the writer has been able to observe experimentally.

Further, the period of activity of the female scales is in agreement with that of the development of the olive fly (*Dacus oleae*), which feeds on the sugary secretions of *Saissetia* and of the no less abundant olive sucker (*Euphyllura olivina = Psylla oleae*) and infests the olives. The destruction of these insects is therefore necessary on account of the favourable conditions which they produce for the development of *Dacus oleae.* The appearance and rapid spread of species of *Cicada* and *Cicadetta* or *Tettigia*, which, by the excretion of large quantities of liquid on the surface of the leaves, produce conditions favourable to the development of the olive fly, would necessitate similar measures.

2. — In Italy, olives are attacked by the larvae of a Swift moth (*Zeuzera pyrina = Z. aesculi.*), known locally as " Rodilegno ", " Tarlo bianco ", " Tarlo giallo ", on pears and apples ; though very destructive, this has so far been neglected ; it attacks a number of trees, including fruit-trees, but in Apulia, Calabria, Sicily and Tuscany prefers olives. In Apulia it is only found in large numbers on the most improved varieties (known as " Ogliarole "), whilst the " Olivastro " and the wild olive are almost immune ; the same may be said of the Nardò olive, which is also partially resistant to *Dacus oleae.* In this district the larvae of *Zeuzera* often attack good-sized branches, provided the bark is still smooth, so that in the hot weather these dry up and drop all their flowers and fruit ; many such branches, however, do not die off at once, but remain as centres of infection for several years, producing no fruit. Many labourers in these districts are very skilful in finding the grubs; eight persons may go over 12 000 to 14 000

trees in three weeks, collecting 50 to 60 thousand grubs, which are paid for at 10 lire (8s, or $ 2) per thousand.

Observations by various entomologists on pear trees, have shown that the moths lay their eggs during July. The writer has found that in Apulia the larvae hardly begin to pupate before the second half of July, while the majority do not do so till the middle of August. Consequently only the earliest moths appear at the beginning of August, the bulk emerging much later. For this reason collecting of grubs should not begin before August, and should continue till the latest pupae are destroyed.

3. — In the spring of 1912 the olives in the neighbourhood of Serranova (Apulia) flowered with extraordinary vigour, many shoots bearing a thousand or more flowers; but only some thirty to fifty set owing to damage by olive suckers (*Euphyllura olivina*) and Hyponomeutids (*Prays oleaellus*). On some branches only one of these insects occurred, on others both. The damage extended over a considerable area, and amounted to some millions of lire.

In the second half of June quantities of *Ageniaspis* emerged from the *Prays* pupae, though many were themselves parasitized by an undetermined microbe within the pupae.

4. — Both in Apulia and in Liguria the writer has observed that the *Prays* moths fly away from the olives in June and July, and seek shelter under the thickest, lowest and most shaded leaves of vines, and to a less extent of pears, plums, cherries and figs. By means of dishes containing poisoned treacle or other liquids, or only water (used in experiments for the control of the olive fly), it was found that the flight takes place principally at the end of June and in the first few days of July. Treacle attracted them more than the other liquids, and water hardly at all. The writer believes that they leave the olives in search of moisture, and in particular of liquids on which they can feed.

5. — With regard to the olive-bark borer (*Hylesinus oleiperda*), the emergence of the adults seems to take place later than is recorded by Costa; in 1912 it lasted from just before the middle of May to nearly the middle of July; in 1913 it was the same, and the females were found still wandering on the bark as late as July 25.

Experiments showed that this insect will not attack cut twigs, even if they are kept fresh, as those confined with such twigs died without egg-laying; on twigs attached to the tree, egg-laying was more abundant on whole twigs than on those cut back. It is thus evident that healthy trees are liable to attack.

6. — It was previously believed that the olives remaining after the disappearance of the olive suckers were safe; but the writer has observed that they are liable to fall in July if situated near parts of the flowering shoot which have been pierced by the sucker. This explains why flowering shoots with twenty or thirty olives on, but only attacked at the base, sometimes wither up completely. This "running off" of the young olives goes on throughout July, and, according to the writer's 1912 observations, stops when the fruits are nearly as big as peas.

ALFREDO RUGGERI, *gerent. responsabile.*

INTERNATIONAL INSTITUTE OF AGRICULTURE

BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

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The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.

ORIGINAL ARTICLES

The Work of the Imperial Institute for the Economic Development of the British Colonies and India

by

Professor WYNDHAM DUNSTAN, C.M.G., LL.D., F.R.S.,

Director of the Imperial Institute,
President of the International Association for Tropical Agriculture.

The Imperial Institute is organised by the British Government with the Cooperation of the Governments of the British Dominions, Crown Colonies and India, to assist economic development, more especially of the Crown Colonies and India, by arranging for general information comprehensive exhibits explaining and illustrating the agricultural and other natural resources of these countries and by conducting enquiries and investigations, required by the local agricultural and other technical departments, and furnishing information respecting the economic possibilities and value of raw materials, especially of new or little known products, to manufacturers, merchants and other enquirers at home.

The first of these branches of work is carried on through the Public Galleries of the Institute in which all the Countries of the Empire are represented by collections of their principal economic products; by maps and diagrams explanatory of their industries and trade; and by photographs, pictures and other exhibits illustrative of their present condition. To these Galleries visitors are admitted without charge. Each section of the Collections is in charge of a Technical Superintendent who is accessible to visitors and who receives enquiries respecting the Colonies and their resources which are replied to verbally or by letter. In the centre of the Galleries is a Stand for the distribution of literature relating to India and the Colonies to applicants for special information of all kinds relating to these countries. Last year the number of visitors to the Public Galleries was 205 503 and 17 545 publications were supplied to enquirers from the Central Stand. The visitors include the general public, students from schools and other educational institutions in London and throughout the home country, who are specially conducted through sections of the Galleries and the features of each section explained; other visitors are commercial men, intending settlers, etc., who are in search of special information respecting particular countries and their possibilities. The Galleries thus provide aa economic conspectus of the resources of the British Empire.

The Central Gallery is occupied by exhibits from South Africa, the West Indies, the Mediterranean Possessions and Australasia; the Eastern Gallery by those of Canada, which extend into the North Gallery; the Western Gallery by those of the Straits Settlements and Malay States, Ceylon and India. The native industries of India are shown in the Indian Pavilion, whilst a Pavilion for Ceylon will be opened next year. The North Gallery contains the exhibits of Hong Kong, East and West Africa, Uganda, Nyasaland, Mauritius, Seychelles, the Sudan and Newfoundland and a part of those of Canada. All the important agricultural products of India and the British Colonies are exhibited with full explanatory labels, whilst for purposes of comparison a collection of the standard commercial products used in British Industries is separately shown in the East Upper Gallery.

The Scientific and Technical Research Department of the Institute includes a large staff of investigators and an extensive series of laboratories, working rooms and reference collections of products. Its chief business is to collect and distribute information respecting the natural products, vegetable and mineral, and the industrial possibilities of each country of the Empire and to conduct, in co-operation with manufacturers and merchants, scientific and technical enquiries and investigations with a view to the utilisation of new or little-known products and their introduction to Commerce. Many of these enquiries and investigations are initiated by the Agricultural Departments abroad and by manufacturers and others at home. Every year several hundred reports are made, chiefly to the Governments of the Colonies, respecting the commercial value of every class of natural product andthe methods of producing it and preparing it for the market. The Department therefore assists Agricultural Departments in the Colonies by conducting investigations which can only be sucessfully undertaken by specially trained investigators, or those which require co-operation with manufacturers and other experts at home. Last year the methods of cultivation or production, the quality and the commercial value of numerous products were examined and reported on, including cereals and other food stuffs, essential oils, tobacco, fibres, tanning materials, gums and resins, rubber, vegetable oils and fats, drugs. A large number of investigations related to the composition and value of newly discovered minerals and have been the means of initiating commercial enterprise in several countries. The Department has also been intimately concerned in the development of the rubber industry in several of the Colonies and with the extended production and utilisation of vegetable oils. Large numbers of enquiries on these and similar subjects are each year received from manufacturers and merchants in the United Kingdom. A large collection of reference samples of important products is maintained by this Department, as to which full information can be supplied with a view to their commercial utilisation. Detailed information respecting the operations of this Department is supplied to Parliament in an "Annual Report." Special reports are also issued as Parliamentary Publications on important classes of products which have formed the subject of investigation in the Department such as "Rubber", "Foodstuffs", "Gums and Resins", "Fibres", etc.

A considerable amount of original research on subjects connected with tropical agriculture is also carried on in the laboratories of the Department. In a series of researches the results of which have been communicated to the Royal Society of London, it has been shown that the occasional poisonous properties exhibited by certain tropical foodstuffs, the Lotus of Egypt, Sorghum, Cassava and Phaseolus are due to the temporary presence within the plants of glucosides which give rise to the production of prussic acid, and the occurrence of which in certain cases may be modified by cultivation. For this subject the name proposed of "cyanogenesis" has been generally adopted and similar observations as to the occurrence of "cyanogenetic" glucosides in other plants have been made by other workers.

The cause of the Molteno or Pictou disease in horses, which is well known in South Africa and Canada, has been traced through investigations in the Department to an alkaloid which occurs in a species of groundsel (*Senecio*) eaten by the animals.

The alkaloids in some of the most important of the Indian aconites have been isolated and characterised and shown to be of medicinal value. Similarly the active constituents of a number of drugs have been ascertained and the chemical constitution of numerous new essential oils has been determined. Among new materials the constituents of which have been ascertained in the Department and which have been introduced to commerce may be mentioned: the oil of the Para Rubber seed as a substitute for linseed oil, the wax of a South African myrtle for the manufacture of polishes for wood and leather, the pods of an Indian *Caesalpinia* as a valuable tanning agent.

Among the more important investigations carried on in conjunction with Agricultural Departments in the tropics may be mentioned the extensive enquiry which is in progress in conjunction with the Agricultural Department of Ceylon in order to determine the precise variations in the composition of rubber latex dependent on variations in age and methods of tapping and on the value of various methods of coagulating and preparing rubber in the form best adapted for commercial use.

The Scientific and Technical Department has become a central establishment for the conducting of enquiries and researches auxiliary to all branches of tropical agriculture; specially trained members of its staff, botanists, chemists, and mineralogists, have been appointed to the technical departments in a number of the British Dominions.

The "Bulletin of the Imperial Institute" is published quarterly and serves not only as a means of disseminating information respecting the enquiries and investigations conducted at the Institute, but also of providing a progress report on the development of agriculture and other industries throughout the world, more especially with reference to the utilisation of the raw materials of the tropics. It also includes special articles by authorities in different parts of the world. Among these may be mentioned, "The Cotton Worm in Egypt" by G. C. Dudgeon, Director General of Agriculture in Egypt, "Agricultural Progress in Uganda" by P. H. Lamb, lately Chief Agricultural Officer in Uganda, "Agricultural Progress in the German Colonies" by Dr. Busse of the German Colonial Office. In order to provide information respecting the cultivation and production of the chief agricultural products of the Colonies the "Imperial Institute Series of Handbooks to the Commercial Resources of the Tropics" is being published. The volumes at present issued relate to the "Agricultural and Forest Products of British West Africa", "Cocoa" and "Rubber". Other volumes are in preparation.

The Imperial Institute is the headquarters of several societies which are conducting work of general Imperial utility, including the Tropical Diseases Bureau and the British Section of the International Association for Tropical Agriculture, a branch of the Association which has its Central Bureau in Paris. In June 1914 an International Congress of Tropical Agriculture under the auspices of this Association will be held in London at the Imperial Institute, and in connection with it two important International Exhibitions will also be held, one relating to Rubber and the other to Cotton and Fibres.

On the Organization of the Meteorological Service in Hungary

by

Dr Sigismund Róna,

Director of the Royal Hungarian Institute for Meteorology and Terrestrial Magnetism at Budapest.

I. — History of the Service.

In the sitting of April 6, 1868, the Hungarian Academy of Sciences approved the scheme, later presented to the Ministry of Public Instruction, which concerned the systematic organization of the meteorological observations to be made in the country and the creation of an independent institute for the purpose. Consequently upon this initiative, and with the approval of the King, given in Vienna on April 8, 1870, the creation of this institute was decided, and its first director was nominated on July 12 of the same year.

In the beginning the Institute was purely scientific and its activity was limited to research on the meteorology and terrestrial magnetism of the country. For a long while, about twenty years, its sphere of action was very restricted, its staff being small (only the director and two employees), and the funds at its disposal were besides quite inadequate (the budget for 1871 amounted to £617). The Institute did not possess an observatory in the strict sense of the word, and in 1871 had at its disposal only 47 stations. In such conditions the Institute had to limit itself to working up and publishing insignificant observations. With time, however, work of practical importance came to be added to the exclusively scientific service, thus enlarging the scope of the Institute; this included the organization of a network of pluviometric stations, established with the object of regularising the watercourses and giving warnings of approaching inundations, and also the organization of the weather forecast service.

These new branches of activity brought the Institute into closer touch with the Ministry of Agriculture, which at first granted a subsidy under the form of assistance for upkeep. In 1893 the Institute passed from the jurisdiction of the Ministry of Instruction to that of Agriculture. From this moment the activity of the Institute began to extend. The means were increased and the staff also. Consequent upon this administrative change, the Institute underwent in 1896 a new organization, under which the Service was divided into sections according to the work done. In 1900, a special building was erected at Ogyalla for the Central Observatory of Meteorology and Terrestrial Magnetism, and finally in 1910 the Institute was transferred to Budapest in its own building, where the seat of the Central Office and one of the first-class stations are situated.

II. — PRESENT ORGANIZATION.

The Institute is divided at present into 6 sections, namely: 1) climatological, 2) pluviometric, 3) forecasting, 4) aerological, 5) observatory, 6) presidential section. At the head of each section there is a chief, appointed by the Director, who distributes the work of the section among the various employees.

1. *Climatological section.* — This section is the centre of the Institute; it has the duty of collecting exact data on the meteorological conditions of the country, and of determining its climate. The available network of climatological observation consists of 180 stations, of which 10 are stations of the first class, 80 of the second, and 90 of the third. The latter devote themselves exclusively to the systematic collection of thermo-udometric data. The stations of the second class, besides instruments for measuring temperature and rainfall, are provided also with the necessary material for observations of other meteorological factors. They register principally: barometric pressure, moisture of the air, direction and force of the wind, and the shape of the clouds. They generally possess a barometer, maximum and minimum thermometers, a psychometer (August type) and sometimes hygrometer and wind-vane (Wild type); some of them are

also provided with heliographs (Campbell-Stokes type) and with thermometers for measuring the temperature of the soil. The stations of the first class differ from those of the second in that they use also self-registering apparatus.

The climatological section works up the observations written on special forms which it receives every month, it checks their correctness and publishes them in the first part of the *Meteorological Annual.* In this first part the daily readings of 14 stations are published *in extenso* on the international model, whilst for the other stations only monthly and yearly summaries are published. This section also collects for the Central Statistical Office the monthly observations of 14 stations which appear regularly in the *Monthly Statistical Publications.* It publishes besides, in a monthly bulletin, the meteorological conditions of the preceding month, and the average monthly readings of 30 stations and their deviation from the normal average. This monthly bulletin, accompanied by a map showing the distribution of rainfall, is designed especially for abroad.

Daily observations are made in all the stations at 7 a. m., 2 p. m. and 9 p. m. The diagrams of the registering apparatus of the stations of the first class are worked up by a subdivision (registering section) of the climatological section. The data afforded by the registering instruments are published in the second part of the *Meteorological Annual.*

Two other small groups of observatories belong to the climatological section. They are devoted to special objects, namely vine-growing and forestry. The Institute does not control them except from the meteorological point of view and, according to an agreement, works up the data and forwards them to the Central Ampelographical Institute at Budapest or to the Central Forest Experiment Station at Selmeczbánya : these two institutions utilize these data from the point of view of growth of vegetation and of phytopathology Eleven second-class stations, all of them situated in vineyards, belong to the vine-growing group of observatories ; they possess, besides the usual instruments, heliographs and thermometers for measuring the temperature of the soil. The forest group includes eight double stations, of which one works under the trees and the other in the clearings.

For more precise and detailed researches on the meteorological conditions of the largest plain of Hungary (Alföld), nine stations have begun working at the commencement of 1913, all of them being situated in the open country. The thermometers are placed in shelters (English type) in identical conditions. It is hoped that these stations established in the plain at equal distances and protected against disturbing influences will furnish data which may be used as a basis even for the theoretical studies of climatology.

2. *Rainfall Section.* — This section is especially devoted to hydrographical purposes. The number of these stations is 1200, each of which disposes of two raingauges ; 14 stations possess also pluviographs. For the distribution of these stations special attention is given to mountainous regions. In a monthly report the section forwards to the Institute the data

on the daily quantities of rainfall measured. During the winter the depth of the snow is also measured. The Institute publishes all these data in the 4th part of its *Meteorological Annual*, partly *in extenso* and partly under the form of monthly and yearly totals. The *Annual* contains, as an appendix, maps showing in detail the distribution of rainfall over the whole country based on the monthly and yearly data. Among the rainfall stations there are 100 for giving warning of approaching inundations which telegraph the data of rainfall to the Hydrographic Section. This in its turn works up these data for its daily reports on the water-level of rivers and streams. During the winter months remarks on the conditions of thawing are added to the telegram, and for this object the stations are provided with thermometers. On the other hand, during the winter all the pluviometric stations send postcards containing information on the snow conditions every ten days direct to the Hydrographical Station. Up to the end of 1912 there was a special storm service in the Institute. The results of its observations were published in the 3rd part of the *Annual*. But at the beginning of 1913 this service, previously undertaken by voluntary collaborators, was handed over to the pluviometric section.

3. *Forecasting section.* — This section draws up the telegram concerning the state of atmospheric conditions and the forecasts as to the same. It publishes two bulletins every day: 1) on the atmospheric conditions of Hungary; 2) on those of the whole of Europe.

The publication of a National Meteorological Bulletin satisfies a want generally felt, for during the growing season the centres interested and the general public wish to have, as soon as possible, reliable information on the meteorological conditions of the country, especially concerning the rainfall, which has so great an influence on the crops. Thus the daily rainfall of about 150 localities is to be found in the National Meteorological Bulletin. As has already been stated, 100 pluviometric stations telegraph data on rainfall to the Hydrographical Section, which forwards them by telephone to the Institute. There are besides about fifty other stations which send telegrams concerning other meteorological factors, namely: 23 stations send readings taken at 9 p. m. and at 7 a. m. on the atmospheric pressure, temperature, wind and clouds, besides the observations made during the preceding 24 hours on rainfall and maximum and minimum temperatures; 27 stations telegraph all the above data with the exception of those concerning atmospheric pressure. The data are used as a basis for the National Bulletin, in which the figures are collected in Tables, and diagrams show the curves of equal rainfall and of equal temperatures, while the text summarizes the weather conditions of the previous day.

The European Meteorological Bulletin contains the weather reports of the evening and of the morning from 14 Hungarian stations, 9 Austrian, 10 German, 9 French and Swiss, 6 English, 5 Scandinavian, 20 Russian, 15 from the Balkan peninsula and 9 Italian, which are sent according to the international form of meteorological telegrams. This Bulletin is illustrated by two maps: one is a synopsis showing the state of the weather in the morning, and the other is a small map showing the isobars of the preceding evening. The text gives a condensed description of the meteorological events of the preceding day in the whole of Europe and publishes the forecasts for the next 24 hours.

The forecasting service itself deals with the international telegraphic service. It receives in its own telegraph office the telegrams from abroad (for the most part collective telegrams arrive from Vienna, Hamburg, Rome and St. Petersburg), and sends out to the foreign central stations the data from Hungarian stations; it also forwards European information to Belgrade, Sofia and Bucharest.

The two Bulletins appear during the first hours of the afternoon; in the capital they are immediately handed over to the newspapers, to the municipal authorities and to private subscribers; to the provinces they are posted. As neither the Bulletins nor the newspapers can publish the weather forecasts rapidly enough these have, since 1891, been circulated throughout the country by telegram. The section draws up at noon the telegram of forecasts; a copy is sent to the Central Telegraph Office, which forwards it all over the country, together with the circular telegram containing the Budapest official Stock Exchange and market news.

The text of the forecast telegram consists of a form of 34 phrases containing all that is required for stating weather conditions. The telegraph offices that have the duty of hanging up the weather forecasts for public inspection are supplied with special frames on which small plates may be hung. These plates bear permanent inscriptions corresponding to the text of the forecast. Each frame can carry 12 plates for the names of the months, 31 for the days of the month and 34 for the text of the forecast. At present about 400 telegraph offices keep these forecasts exposed to the public.

On the strength of the information received by telegram the forecasting section draws up a weather report every two weeks and sends it to the agricultural section of the Ministry of Agriculture. This report shows on a chart the distribution of the rainfall (and the areas damaged by hail) and completes the report on the state of the crops.

4. *Aerological section.* — With the exception of some stations at an elevated altitude, the Institute has not done much in this direction. It is only since the beginning of 1913 that it has included in its programme the study of the upper strata of the atmosphere, limiting itself to: 1) sending up daily a pilot balloon and following its course with theodolites; 2) sending up free unmanned ballons on the same days as other countries send up theirs, as per international arrangement. The data thus acquired are sent to the seat of the International Scientific Aerostatic Committee at Strassburg.

5. *Observatory.* — The Central Observatory of the Institute is situated at Ogyalla in the small Hungarian plain (Kis Magyar Alföld). The Observatory building includes the offices and the dwellings of some of the officials. On the tower anemographs are placed, while the meteorological instruments are situated in the garden. Two other observatories are attached to it, one for terrestrial magnetism and the other for seismological observations and

for the study of the electricity of the atmosphere. The data furnished by the Observatory are published in the second part of the *Meteorological Annual,* which contains the hourly readings of all the weather registering apparatus, the data of terrestrial magnetism and those of the potential of the electricity of the atmosphere.

6. *Presidents' section.* — This deals with administrative affairs, such as questions relating to the budget, part of the correspondence, inventories and the like.

The Institute possesses a well-equipped workshop in which the instruments are built and repaired.

The library contains at present 8246 books and 3646 pamphlets, mostly on meteorology and worth nearly £3 000.

The majority of the collaborators of the Institute are unpaid, but they get some bonuses. Thus a pluviometric station is allowed an average of 25 shillings a year, and 50 shillings if it attends also to sending off the telegrams. A second-class telegraph station gets £3 6*s* 6*d;* some stations the permanency of which is especially desirable, or which have self-registering apparatus, get from £4 3*s* to £8 6*s*. The total amount of bonuses granted by the Institute amounts to about £1458.

Regular inspections ensure the orderly and regular service of the stations.

The principal official publications of the Institute are: 1) the *Meteorological Annual,* published every year in four volumes; 2) the two *Daily Meteorological Bulletins;* 3) the *Scientific Annual* containing, *a*) a large series in two languages for the publication of original work, *b*) a smaller series published only in Magyar; 4) *Report upon the Year's Work of the Institute* in the Magyar and German languages.

Besides the above, an Official of the Institute publishes with its assistance a Monthly Meteorological Review called Időjárás (" The state of the atmosphere "), now in its eighteenth year. Since its first appearance it has been distributed free of charge to about 350 collaborators.

While chiefly dealing with the knowledge of the meteorological conditions of Hungary, the Institute keeps in touch with kindred institutions abroad. It must also be mentioned that the data on meteorological conditions which the Institute collects at the request of public offices and private persons increase from year to year.

The name of the Institute is *Magyar Királyi országos Meteorologia és Foldmágnességi Intézet* (Royal Hungarian Institute of Meteorology and Terrestrial Magnetism). Its seat is at Budapest and it is a dependency of the Ministry of Agriculture. Its yearly budget amounts generally to about £9 700, and its staff is composed of 26 officials.

The Present Status of the Fruit Industry of the Dominion of Canada

by

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INTRODUCTION.

Historical. — Fruit has been cultivated in Canada since the early part of the 17th century when the French settlers in Acadia, now the Province of Nova Scotia, and also the settlers along the banks of the St. Lawrence in the present Province of Quebec, brought with them seeds and trees from France and planted them. It has, however, been only during the past fifty or sixty years that fruit has been grown to any large extent for commercial purposes.

Kinds cf fruit grown in Canada. — The kinds of fruit grown in Canada for sale are apples, pears, plums, cherries, peaches, apricots, grapes, currants, gooseberries, raspberries, blackberries, loganberries, strawberries and cranberries. There is also a large sale of blueberries and huckleberries which are picked from plants in the wild state.

Fruit districts of Canada. — There is a very large area in Canada suited to the growing of fruit. Apples are grown to the largest extent in the provinces of Ontario, Nova Scotia, Quebec and British Columbia, but they grow well also in the provinces of New Brunswick and Prince Edward Island. The largest number of bearing apple trees is in the Province of Ontario where in 1910 there were 6 544 788 trees and 2 053 302 more trees not yet bearing. In the prairie provinces of Manitoba, Saskatchewan and Alberta tree fruits are not grown except to a limited extent in the most favourable locations, where some apples, crab apples and plums are produced.

The commercial culture of the pear is confined mainly to the provinces of Ontario and British Columbia, though pears succeed well in Nova Scotia, and the hardiest varieties can be grown in Quebec, New Brunswick and Prince Edward Island.

, The most favourable climatic conditions for plums are found in Ontario, Nova Scotia and British Columbia, but certain varieties of the Domestica plums can be grown in Prince Edward Island, New Brunswick and Quebec. The native plums *Prunus nigra* and *P. americana* are grown successfully in the colder parts of Canada, and the early varieties succeed in te prairie provinces.

Ontario produces the largest quantity of cherries and they have been planted to a considerable extent in British Columbia, but they are grown successfully also in Nova Scotia and Prince Edward Island and to a limited extent in favoured parts of the Province of Quebec.

Peaches are grown commercially in the south-western part of the province of Ontario and in British Columbia but they can be successfully grown also in the warmer parts of Nova Scotia

The commercial culture of grapes is confined to south-western Ontario, but they can be ripened also in all the other provinces of Canada with the exception of the prairies, where only the very earliest can be got to ripen when grown in the most favourable locations and protected in winter.

Blackberries are grown mainly in Ontario and British Columbia and the culture of loganberries is confined to the warmer parts of British Columbia; but currants, gooseberries, raspberries and strawberries are grown in all the provinces.

Value of fruit exported from Canada 1912-13. — A large proportion of the fruit grown in Canada is consumed there, but the following figures give the quantity and value of that which was exported during the fiscal year beginnng April 1st, 1912, and ending March 31st, 1913:

	Value $
Fruits, dried (3 199 539 lbs)	214 442
Apples, green or ripe (1 374 769 barrels) . . .	4 047 806
Berries of all kinds	100 019
Canned and preserved fruits	220 786
Other fruits	96 741
Total fruits exported . . .	4 679 794

VARIETIES AND BREEDING.

Fruits of Canadian origin. — While it is expected that before long a much larger proportion of fruits grown commercially in Canada will be of Canadian origin, at present only a small proportion are such. Some of the best known fruits originated in Canada are:

Apples: Fameuse, McIntosh Red, St. Lawrence, Ontario, New Brunswick, Canada Baldwin, Banks Gravenstein, Swayzie Pomme Grise, Baxter, Trenton, Crimson Beauty.

Peaches: Fitzgerald, Banner, Tyehurst.

Pears: Dempsey, Ritson.

Plums: Glass Seedling, Mount Royal, Raynes.

Cherries: Windsor.

Grapes: Brant, Canada, Moyer, Burnet, Kensington, Jessica.

Raspberries: Herbert, Hilborn, Smith Giant.

Black currants: Saunders, Beauty, Kerry, Magnus, Clipper, Climax, Eagle.

Gooseberries: Pearl, Josselyn (Red Jacket).

Strawberries: Williams.

Fruit breeding. — Fruit breeding was begun in Canada between forty-five and fifty years ago by private persons and several of the varieties mentioned above were the result of hand pollination. During recent years the Federal and Provincial Governments have rendered assistance, and fruit breeding is now an important part of the work at the Central Experimental Farm, Ottawa, Ont., the Horticultural Experiment Station, Jordan Harbor, Ont., and the Ontario Agricultural College, Guelph, Ont. It is at Ottawa, however, that most of the work has so far been done. Cross breeding was begun there in 1894 and over 2000 apple trees have been grown as the result of such work during the past 19 years. A large number of these have fruited and have been propagated and distributed free for test. Since 1890 between 5000 and 6000 apple trees have been raised from seed where only one parent was known. There have been promising seedlings in this lot and 81 have been named. Some 24 000 seedlings of the hardiest apples are being grown at the Federal Stations in the prairie provinces in order to eliminate the tender trees by exposing them to the severe winters, and it is proposed to try much larger numbers. Other fruits which have been used in breeding work are plums, grapes, currants, gooseberries, raspberries and strawberries. The objects in breeding are to obtain hardier good varieties, to extend the cultivation of fruits into colder districts, and to obtain better varieties for the principal fruit districts. Owing to the long distance which is necessary to ship fruit in Canada, varieties having good shipping properties are sought for.

During the last fifteen years records have been kept of the yields of individual apple trees at the Central Experimental Farm, Ottawa, and it has been found that some trees of any one variety planted at the same time and under very similar conditions yield much more than others. Trees have been propagated from heavy and light bearing trees to learn if this habit continues when the trees are grafted. These trees are now beginning to bear and some definitive information is looked for soon.

CULTIVATION AND MARKETING.

Methods of culture. — In a country as large as Canada the methods of culture vary somewhat. In the great fruit districts of Ontario and Nova Scotia the practice is to cultivate the orchards until about the middle of July and then to sow seed for a cover crop, such as red or crimson clover, vetch or rape, which will be ploughed in early the following spring. Where the climate is colder it has been found good practice to merely plough the orchard in the spring, harrow it a few times to get the weeds under control, and then sow seed for a clover crop in the month of June. This system is desirable where there is danger of the trees growing too late and being injured by winter. In the province of Quebec many growers prefer to leave their orchards in sod to ensure thorough ripening of the wood before winter. In parts of British Columbia irrigation is practised.

Most of the grapes are grown in the Province of Ontario. The vines are usually planted 10 × 10 feet apart and are tied to a trellis of two or three wires. In many places in Canada where the winter is cold but the summers very warm, grapes are grown for home use by covering the vines with soil during the winter. Except in British Columbia, strawberries are not grown to any extent in the hill system or as single plants as they are in Great Britain and Europe, but in matted rows, the plants being six inches or less apart. By this method the plants protect each other and are not so subject to heaving when the ground freezes, nor is the crown exposed so much to the sun.

Spraying. — Spraying is practised by a large proportion of the fruit growers in Canada. The principal insecticide used for biting insects was Paris green until quite recently, but arsenate of lead is fast taking its place. For San José scale the lime-sulphur wash is used when the trees are dormant. The lime-sulphur is now generally, used for spraying to control certain diseases, such as apple scab and peach leaf curl, when the trees are dormant, and also to some extent during the growing season, although Bordeaux mixture is still commonly used as a summer spray. There is no good means for controlling aphis on tree fruits, although tobacco extracts, soaps and kerosene emulsion are all effective.

Transportation facilities. — The distances to which fruit has to be transported in Canada are in some cases very great, both for the home market and to reach the ports in order that it may be sent abroad, but within about two years there will be three trans-continental railways from the Atlantic to the Pacific oceans, and these, with the many branch lines already in operation, afford excellent means of distributing the fruit. Refrigerator cars are furnished by the railway companies when needed.

Markets — The home market for Canadian fruits is growing rapidly. There are now about 8 000 000 people in Canada who consume a very large quantity of fruit. In the Prairie provinces where tree fruits do not succeed well and where the main crop is cereals, it is estimated that there are 171 000 square miles suitable for cultivation. This area is being rapidly populated and offers a splendid home market for fruit from the other provinces of Canada. Great Britain and European countries take large quantities of Canadian fruit, as has been shown above.

Co-operation. — The spirit of co-operation in the fruit growing industry is increasing rapidly in Canada, and much has been accomplished in this direction already to assist the fruit grower in getting better prices for his products. In the province of Ontario there are 52 co-operative fruit growers' associations; in Nova Scotia, 32; in Quebec, 8; and in British Columbia, 10. In Nova Scotia, Ontario and British Columbia most of the associations have united to form central selling agencies in order that they may control prices obtained for their fruit. These are known as the United Fruit Co's. Limited, Berwick, N. S.; The Ontario Fruit Growers Limited, Toronto Ont. ; The Okanagan United Growers Limited, Vernon, B. C.

Many of the local co-operative associations are incorporated companies. They buy supplies as well as sell the fruit. In the best organized associations there is a manager who is paid a percentage on the amount of produce handled. There is a central packing house so that the fruit may be uniformly graded. In some cases the returns are pooled and the growers are paid according to the proportion of the different grades of fruit furnished by the producers. In other cases the association ships but does not pack co-operatively and each man's fruit sells on its merits. The officers of a local association usually consist of the president, vice-president, secretary-treasurer, and five directors. There is also a manager on salary, or paid on commission, who supervises the grading and packing and shipping of the fruit and other matters relating to the association.

Legislation —The Canadian Constitution gives the Federal Government control of certain kinds of agricultural legislation which is interprovincial and effective throughout the whole of Canada. In relation to the fruit industry, for instance, the size of packages in which fruit may be marketed is controlled by the Dominion Government. There are also standards fixed by the Government for the different grades of fruit marketed. The marking on the packages is also regulated by the Government.

Legal barrels, boxes, and baskets in Canada. — The minimum size of the apple barrel in Canada is ninety-six quarts. When apples are packed in boxes for export for sale the inside dimensions of the box must not be less than ten inches deep, eleven inches in width, and twenty inches in length. When apples are packed in boxes or barrels having trays or fillers wherein it is intended to have a separate compartment for each apple, the size of box need not be as above. Boxes for small fruits are two-fifths of a quart and fourt-fifths of a quart. Legal baskets must hold two and two-fifth quarts, six quarts, eleven quarts and fifteen quarts respectively.

Packing and marking fruit. — The name and address of the packer must be stamped on every closed package of fruit. The name of the variety or varieties must be stamped on every closed package of fruit. There must also be a mark indicating the grade of fruit.

Legal grades of apples. — There are four legal grades of apples offered for sale in Canada or exported, namely: Fancy, No. 1, No. 2, and No. 3.

Fancy fruit consists of well grown specimens of one variety, sound, of uniform and of at least normal size and of good colour for the variety, of normal shape, free from worm holes, bruises, scab and other defects, and properly packed. No. 1 quality is fruit which has no culls and consists of well-grown specimens of one variety, sound, of not less than medium size and of good colour for the variety, of normal shape and not less than ninety per cent. free from scab, worm holes, bruises and other defects, and properly packed. No. 2 quality is fruit which has no culls and consists of specimens of not less than nearly medium size for the variety, and not less than eighty per cent. free from worm holes and such other defects as cause material waste, and properly packed.

The faced or shown surface gives, by law, a false representation of the contents of the package: if more than fifteen per cent. of such fruit is substantially smaller in size than, or inferior in grade to, or different in variety from, the faced or shown surface of such packing.

In regard to fruit imported into Canada: "The Governor in Council by regulation may prescribe the kinds of imported fruit, the packages containing which must be branded or marked ", prescribe the brands or marks to be used thereon ; prescribe the manner and places in and at which such fruit is to be inspected and such packages branded or marked

In order that the above regulations shall be complied with, Inspectors are employed who inspect the fruit at the packing houses, on the markets, at the chief shipping points, and at other places. It is the Inspector's duty to mark any package containing fruit " Falsely Marked ", or " Falsely Packed ", if it does not comply with the regulations There are also fines for improper packing and marking

GOVERNMENT AID TO FRUIT GROWERS

Colleges. — There are four Agricultual Colleges at which a four years, course in agriculture is given and from which, or through the Universities with which they are affiliated, the graduates receive the degree of Bachelor of the Science of Agriculture (B S A). These colleges are the Ontario Agricultural College, Guelph, Ont , the Macdonald College, Macdonald College, Que.; the Trappist College, La Trappe, Que.; and the Manitoba Agricultural College, Winnipeg, Man At these colleges the students receive a special course in horticulture. There is also the Maritime Agricultural College, Truro, N. S , at which the students are given a two years' course in agriculture and horticulture, and an Agricultural School at Ste. Anne de la Pocatiere, Que. In connection with the Agricultural Colleges, short courses in horticulture lasting from one to two weeks are given These colleges are supported mainly by the provincial governments and by private gift, but the Federal Government also gives some assistance

Experimental Farms. — There are sixteen Experimental Farms or Stations in Canada supported by the Federal Government, of which the Central Farm is at Ottawa, Ont. The appropriation for the maintenance of these and for new farms is this year $810,000, exclusive of salaries of the permanent staff

At the Experimental Stations experiments in methods of culture, tests of varieties, spraying and plant breeding are carried on in order to aid the fruit growers in the different provinces. The divisions of Chemistry Entomology and Botany, with headquarters at the Central Farm at Ottawa, lend their aid in the more scientific aspects of horticulture. The Farms are bureaus of information to which fruit growers may write and receive replies without any cost to themselves. Annual reports and bulletins are published giving an account of the work done. There are also experimental farms associated with the provincial agricultural college.

District or County Instructors. — In the provinces of Ontario, Quebec and British Columbia the provincial governments have instructors or district representatives whose duty it is to go through the country and give free information and instruction to farmers and fruit growers and in some cases to carry on demonstrations of the best methods of orchard practice They have their headquarters, where people may come to get information or where they may write for it. In the province of Ontario there are now 31 representatives and an almost equal number of assistants

Demonstration Orchards. —In the provinces of Nova Scotia, New Brunswick, Prince Edward Island and British Columbia there are small orchards of from one to five acres to demonstrate the best varieties and methods of culture. There are, for instance, 35 of these in Nova Scotia and 23 in New Brunswick. The provincial government furnishes the trees free and sends a man to plant them, the owner caring for the trees according to directions for ten years or more The Government also sometimes supplies a spray pump.

Exhibitions. -- The Governments, both Federal and Provincial, aid the fruit grower by assisting in making exhibits of fruits both in Canada and in other countries, in order to advertise the good quality of Canadian fruit and thus help to find markets for it. Rules for judging fruits have been adopted by several of the provincial fruit-growers' associations.

Packing Demonstrations. -Both the Federal and Provincial Governments aid the fruit grower by giving demonstrations by expert packers in packing fruit. Last winter, for instance, 40 such demonstrations or schools were conducted in the province of British Columbia alone.

Cold Storage and Markets. — The General Government aids the fruit grower by helping him to get his products to market in good condition. For the shipment of fruit in refrigerator car loads intended for export, the Government pays icing charges to the extent of $ 5.00 per car. Arrangements are also made by the Government to have small cold-storage chambers on steamships reserved for the carriage of fruit only. This has resulted in a large increase in the amount of tender fruit exported. Temperature records are kept by the Government on the steamers carrying fruit in order to ensure its being well looked after, and inspectors are employed by the Government to inspect the cargoes both on steamers and in refrigerator cars.

Subsidies are also given by the Government to aid in the erection of cold-storage plants throughout Canada And also in the precooling of fruits before shipment.

Protection against diseases and injurious insects — There is an Act of Parliament known as the "Destructive Insect and Pest Act" which empowers the Government to inspect fruit trees coming from other countries into Canada, and to fumigate them at stations controlled by the Federal Government. The Provincial Governments also have laws within the provinces giving them power to inspect trees in nurseries and to enforce fumigation before shipment from the nurseries. Inspectors of the Entomological Division and Botanical Division of the Department of Agriculture, and men employed by the Provincial Government, spend much time in the orchards seeking information in regard to any injurious insects and diseases and finding methods of controlling them.

Fruit-Growers' Associations — There are seven provincial fruit-growers' associations in Canada in the provinces of Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba and British Columbia. These associations are supported in part by the Provincial Governments. Subjects relating to the fruit industry are discussed at their annual meetings, which last about two days. They are powerful agents in bringing about needed legislation in regard to the fruit industry. From time to time representatives of these associations meet at Ottawa in a Dominion Conference in which matters affecting legislation for the whole of Canada are discussed.

Fruit Crop Report — A monthly report on the condition of the fruit crop in Canada and in other countries is published by the Federal Government during the growing season. Newspaper reports are also issued from time to time. The information for these reports is gathered from a large number of fruit growers throughout Canada. The Provincial Governments also issue reports.

Bulletins and Periodicals. — In addition to the report and bulletins which are published by the Dominion and Provincial Governments, and which are furnished free to anyone who asks for them, there are several horticultural periodicals published by private companies in Canada which devote considerable space to fruit culture.

Canning Factories — Much fruit is canned in Canada and new factories are starting from time to time, and there is every prospect that this phase of the fruit industry will develop very much.

In conclusion we beg to state that the outlook for fruit growing in Canada is good. The areas where fruit can be successfully grown are, in the case of the apple particularly, so great that if a large proportion were planted Canada could supply the world for a long time to come. What is needed is good organization and good distribution all over Canada in order to avoid gluts and these conditions give greater promise of fulfilment every year.

Elements for the Valuation of Fruit Trees

by

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It is only quite recently that fruit trees have begun to be considered as a revenue-bearing capital, the value of which can be ascertained only by knowing the value, expressed in money, of the crops yielded by them every year or in longer periods. The methods hitherto adopted for the determination of the value of fruit trees were based on very vague estimations, which in cases of the sale of orchards or of individual trees led mostly to very low figures or in other words to the disadvantage of the vendor.

In order to introduce the above criterium into practice, it became necessary to procure that basis which rendered it possible to get, in figures, the complex factors involved; it consisted in the main in determining the most reliable average figures concerning the greatest age of the fruit trees, the commencement of their bearing, and the yields in fruit or in money which the trees can give in the whole course of their life. The few data to be found in the literature bearing on this subject were not satisfactory, owing to their being partly improbable. It was thus advisable to take steps to get reliable figures which would also be of use in revising existing older observations. In collaboration with the " Austrian Fruit-growers' Association " of Vienna, I have undertaken the not easy task of examining and arranging the figures obtained from prominent and trustworhytfruit growers, living at a distance from each other. I cannot enter here into the details of this work which I have treated exhaustively in the " *Verhandlungen der zweiten Tagung der Oesterreichischen Obstbau- und Pomologen-Gesellschaft* ", Vienna 1911. I shall give instead the chief results of my research, together with a brief discussion of the same. In the same reports there is another paper of mine under the title " A valuation of fruit trees based on new considerations ", which I mention because the two papers are connected and complete each other.

The following summary is based on 41 trustworthy reports made in different countries, and gives information, referred to standards, half-standards, bush trees and other forms, on those three main questions which have been considered the foundation of the valuation of fruit trees. For the sake of comparison, the accompanying table (p. 1821) includes those figures, mainly taken from the works of Prof. Christ and E. Junge (*Anleitung für die Wertund Rentabilitätsberechnung von Obstkulturen.* Berlin, 1905. P. Parey), which have hitherto been accepted as reliable.

The table gives, for bush trees and other forms not standards or half-standards, a series of indications regarding beginning of bearing, highest age, and total yield which were previously not available.

With standards and half-standards it appears that, except for walnuts, there is not much difference between the new and the old data respecting the age at which the trees begin to bear. On the contrary, with but few exceptions, the average figures for greatest age and total yield hitherto accepted are shown to be too low. The exceptions are in the greatest age of the pear and the total yield of the plum.

I am quite aware that, especially in questions relating to yield, fixed figures should not be used, but sometimes it is necessary to use some useful average figures and particularly in the valuation of fruit trees it is impossible to do without them. Of course the averages adopted must be recognized by expert circles. This is the case here, for the members of the Austrian Fruit-growers' Association have unanimously decided to consider for the present the average figures given in the table as trustworthy.

A very important premise for a possibly exact valuation of fruit trees is the correct knowledge of their age. Usually this is not known, and the valuations to which recourse had to be had until recently gave very doubtful results, as was often subsequently proved by felling the trees.

By considering the average annual increase of the circumference of the stem, measured at a height of 3ft. 3 in. from the ground, a means has been now found of avoiding gross errors in the estimation of the age of standards

Summary of General Averages, compared with the data hitherto accepted

Kind of fruit	Bush trees and other forms						Standards and half-standards					
	Commencement of bearing		Highest age		Total yield of fruit during life of tree		Commencement of bearing		Highest age		Total yield of fruit during life of tree	
	Average						Average					
	Hitherto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry	Hithesto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry	Hithesto accepted	On the basis of 1911 enquiry	Hitherto accepted	On the basis of 1911 enquiry
					lbs	lbs					lbs	lbs
Apple	4	4	33	30	678	1100	10	8	60	70	3630	5200
Pear	4	4	33	30	1150	1080	8	8	80	80	5400	7220
Quince	—	5	—	30	—	690	—	6	—	35	—	770
Medlar	—	4	—	40	—	385	—	5	—	40	—	715
Plum	-	5	—	30	—	850 to 1050	5	5	30	35 to 40	1320 to 1760	1550
Cherry	—	5	—	30		800	6	6	40	60	2062	2280
Morello	—	4	—	25	—	600	5	5	30	40	1350	2350
Peach	3	4	12	15	175	300	—	4	-	15	—	350
Apricot	—	3	—	20	—	550	4	4	20	25	690	895
Walnut	—		—	—	—	—	20	12	100	105	3630	4420
Hazel .	—	5	—	35	—	155	—	—	-	—	-	—
Chestnut	—	—	—	—	—	—	—	12	—	120	—	6630
Red currant	3	3	16	20	110	200	—	3	—	10	—	100
Gooseberry	3	3	16	15	82	190	—	3	—	15	—	100

and half-standards. Prof. Steglich has done much work in this connection and I also for many years have been occupied with the subject.

Under normal conditions of vegetation the average annual increase of the circumference of the stem is

	cm	in.
Apple and Apricot . .	2.0	0.8
Walnut	. 2.5	1.0
Pear and Plum.	. . 3.0	1.2
Cherry and Morello . .	. 4.0	1.6

Thus, for instance, a cherry tree measuring 40 cm. (15.7 in.) in circumference at a height of 3ft. 3 in. would be ten years old, while an apple tree of the same girth would be 20 years old. If the conditions of growth, such as soil, position and climate, be duly taken into account, experience has shown that the error is reduced within such limits as not to have much effect upon the valuation of the trees under discussion.

The above-mentioned basis allows us to work out a useful valuation of trees. This calculation, which is based upon the special considerations of my colleague Herr. I. Gürther, is however complicated and requires much preparatory knowledge. I have therefore suggested to my above-named collaborator and my former assistant Herr Th. Horn to draw up some tables, at least for standards and half-standards of the most important fruit trees, which should allow of the money value of the trees grown under normal conditions being read straight off as soon their age was known or determined. These tables have been inserted in the reports of the transactions of the second meeting of the Austrian Fruit-growers' Association held in Vienna in 1911.

The Distribution of Forests in the Natural Regions of Switzerland

by

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Switzerland is divided topographically into three regions: the Jura, the Plain and the Alps. This division is equally in accordance with oro-geological structure. The regions are also important from the point of view of the forests; thus, if we take the available statistics, we find that the grouping of the wooded land is very different in the three regions mentioned. In the present article I shall limit myself to a brief description of the forest character of each of these natural divisions.

The *Jura* rises in a steep and even slope from the plain to a considerable height, especially in its western part; but it rarely passes the upper limit of the forests. Its wide rolling top, formed of plateaus only cut up by small valleys and coombes, is almost entirely without water, owing to the nature of the rocks. For this reason habitations are few and always occur near springs in the larger valleys; the Jura villages are chiefly industrial, and often of considerable size.

In the Jura, as elsewhere, the altitude determines the occurrence of distinct zones of vegetation; topographical conditions and the nature of the soil modify the distribution of moisture and heat sufficiently to give rise to various stations characterized by well-defined plant formations. According to altitude, three zones are distinguished: the *lower zone* roughly from

400 to 700 m. (1300 to 2300 ft.), in which cereals and walnuts, and even vines, still thrive; the *middle* or *montane zone* from 700 to 1300 m. (2300 to 4300 ft.), largely occupied by forests, meadows and moors; the *upper* or *subalpine zone*, from 1300 m. (4300 ft.) upwards, occupied by the upper limit of the forests (which hardly pass 1400 m. = 4650 ft.) and the pastures which cover all the high ridges.

Altitude is a very important factor in the distribution of forests. These occupy the bulk of the zone between 700 and 1300 m; indeed, of all the plant formations for the Jura, forest undoubtedly occupies the largest area and plays the leading part in determining the physiognomy. Further, the proportion of waste ground is far and away smaller in this region than in the Alps. The result of these circumstances is that the cantons belonging essentially to the Jura are among the best wooded in Switzerland: Schaffhausen has 42.6 per cent. of its total area and 44.6 per cent. of the productive soil under forest; in Solothurn these figures are 36.7 and 38.2, and in Neuchâtel 30.9 and 36.1.

In general also it is in the Jura that the forests are most extensive and thickest; dividing up of land is much less advanced than in other parts of Switzerland. The slopes are generally uniformly wooded over long distances, while on the plateaus, which are particularly numerous in the south, frequently only blocks of wood remain. The forest map of Switzerland shows an almost uninterrupted wooded belt marking the whole extent of the Jura from Geneva to Schaffhausen, for a length of 150 miles, with an average width of 12 miles.

The Swiss *Alps* form a segment of the great arc of Central Europe. For the vertical distribution of vegetation the following altitudinal zones are generally distinguished: the *hill region*, 200 to 700 m. (650 to 2300 ft.), which is the true agricultural region; the *montane region*, 700 to 1200 m. (2300 to 4000 ft.), whose characteristic is forests of broad-leaved and coniferous trees mixed; the *alpine region* 1200 to 2600 m. (4000 to 8600 ft.), whose lower part contains conifer forests and pastures, while the upper part is purely pasture, though sometimes with some trees on it; the *region of eternal snow* comprising the heights above 2600 m.

The proportion of forest is generally less in the Alpine cantons than in the Jura. Contrary to what one might at first sight suppose, agriculture has taken a hold there and maintained itself better; this is due on the one hand to the wide protecting forest belt, and on the other to the configuration and the nature of the soil.

The crystalline rocks decompose readily; they generally give a deep soil, which holds moisture and is fertile; they contribute to rounding off and softening of the surface of the land. Further, this land is rarely lacking in springs, for the rocks make good beds for throwing out the rain and snow-water soaking down from above. Colonization has thus been possible almost everywhere in the Alps: from the chief villages in the valleys, hamlets have split off here and there at different heights where there are springs;

higher up there are the " mayens" and " mazots " (1) on the lower mountains; further up still, isolated chalets occur on the alpine pastures.

Man has thus established himself to some extent wherever favourable conditions were found : the forest has had to give way to him ; it has been heavily cleared to a great height to make way for the crops of the mountaineer. The present-day forests are mostly only more or less extensive remnants of those which covered these regions before the advent of man. Fire and axe have further increased the space required by the mountaineer, and his goats and sheep have completed the work. Forest was often cleared even from places where its presence was really essential.

Besides this, a considerable extent of land is unproductive owing to its position. Indeed the forest has had to struggle not only against the repeated attacks of man, but against the ravages of avalanches, rock-falls and torrents. For all these reasons, the proportion of land under forests in the Alps is often very low, a fact which is very often due to the natural causes of a climatic or edaphic nature; the forests are restricted to the soils least suitable to agriculture from lack of fertility or from position. Thus the best wooded canton, Lower Unterwald, has only 23.9 per cent. of its total area and 31.9 per cent. of its productive area under forest ; in Valais these figures fall to 14.7 and 26.7.

The dividing up of the forests has also been influenced by these facts. The chief woods extend along the sides of the valleys, formihg a wider or narrower belt, varying according to aspect and shape of the ground. Steep slopes reaching right down to the torrents, and those facing north, may be wooded throughout; in this case the forest reaches from the thalweg right up to the limit of tree-growth. On gentle slopes, and particularly on the south aspects, forests have largely given place to field crops ; on the steeper south-facing slopes, however, forests re appear above a certain height, but here again any less steep parts or shoulders are under cultivation. The upper region of the high mountains is given over to pasture, often with the more or less scanty tree growth of the meadow-woods and wooded pastures. Higher up, only the last outliers of woody growth occur, and they give place to the vast zone of subalpine turf, followed by waste land, rocks and glaciers.

The *Plateau* is the region between the Jura and the Alps; from the cilmatic point of view it may be considered the most favoured of the three natural regions of Switzerland because it is the least elevated. Its configuration, however, hardly justifies the title of plateau ; thus the name of " hill country " (" Hügelland " and " Mittelland ") seems more logical.

It is difficult to get a general idea of the distribution of forests in the intermediate region. The cantons between the Jura and the Alps, on " diluvium " and " molasse," many of them reach up onto the Jurassic plain or else include part of the Alps or Prealps; the political divisions thus do not correspond with the natural ones. The situation and distribution of the forests can be judged more or less from what has already been said. In the region of the "molasse" and the glacial deposits, the ridges between the valleys are mostly covered by dense forest masses, while the slopes, especially those facing south, are given over to agriculture, unless their steepness or lack of fertility makes wood preferable. In the Prealps, where the "nagelfluh" predominates, and where private woods are often abundant owing to the splitting up of the ancient communal properties, only small patches of wood occur scattered in the fields.

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(1) " Mayens " are the half-way houses occup'ed by the herdsmen in early summer and autumn, before and after the alpine grazing season; " mazots " are barns or store-houses. (*Ed.*).

The plateau region is the most thickly populated in Switzerland: indeed 60 per cent. of the total population of the country lives in this intermediate region, though it only occupies 29 per cent. of the surface; it is five-and-a-half times as thickly populated as the Alps. This fact has a great influence on the distribution of the forests and the percentage area under forest in the different regions. Indeed the very varied utilization of the soil that we remark is by no means arbitrary; it is a factor of the topographical and climatic conditions of the country, which the farmer must take into account in order to get the best yield from the soil; the plain and plateau regions of Switzerland are those in which woods occupy the least extent of cultivable surface: the canton of Geneva has 11.2 per cent of its productive land under forests, making 9.1 per cent. of the total area; in Bâle-Town these figures are 20 per cent. and 16.1 per cent. Further, subdivision has led to the woods occurring as many small stands. The character of the proprietors has also some importance on the distribution of the woods. In general the more public forests there are, the larger is the area and the better the arrangement of the individual woods, which then often cover considerable areas which might be profitably put under crops.

Switzerland at present possesses something near 2 ½ million acres of forests, distributed among the three regions as follows:

Jura	20	per cent.
Plateau	25	»
Mountains	55	»

In other words, more than half the Swiss forests occur in the Alps, a quarter in the Plateau, and a fifth in the Jura. The percentage of wooding in the three natural regions is approximately 33 in the Jura, 22 in the Plateau and 17 in the Alps.

We may perhaps be able to return on a future occasion to certain conclusions which occur to one when one considers the international importance of forests in the region of the sources of certain great European rivers.

Recent Experience and Progress in Dairying in Germany

by

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During the last decades, dairying in Germany, thanks to the constant extension and improvement of cattle keeping, has developed to such an extent that the yearly production of milk is now worth about £ 150 000 000 in round numbers and is consequently superior in value to the bread stuffs, which in 1909 amounted to £ 141 000 000. Notwithstanding the extraordinary increase of milk production, it has not been able quite to keep pace with the rapid increase of population, which is in round numbers 900 000 per annum. For whilst in 1871 the German Empire had an excess of dairy products and exported about £ 1 912 000 worth, since 1896 it has been obliged every year to import increasing quantities from abroad in order to meet demands. In 1912 the excess of importation amounted already to £ 9 617 650, or 6.5 per cent. of the home production. It behoves cattle breeders to increase still further the milk yield of the cows, in order to render Germany independent of foreign countries. As for the dairy products imported, it is especially to be mentioned that the introduction of cream during the last decades has attained a most unexpected importance. This is connected with the fact that, while, according to existing tariffs, butter pays a duty of about 10s per cwt., milk and cream are duty free.

The number of cows at present existing in Germany is in round numbers 11 millions. If the average milk yield per cow be taken at 506 gallons (2 300 litres) per annum, the total amount of milk produced every year is about 5 566 million gallons. In the large towns the daily consumption of milk per inhabitant ranges from 0.39 to 0.72 pint per day. In the smaller towns the consumption is greater and in the country it is still more so. On an average 0.79 pint per head per day may be taken, or 36 8 gallons per annum. With a population of 67 millions in round numbers, this amounts to a consumption of 2417 million gallons, which is 43 per cent. of the whole quantity of milk produced. If it be further assumed on the strength of careful calculation that the rearing and fattening of calves absorbs 445 million gallons, or 8 per cent. of the milk produced, it is evident that at present only about 49 per cent. remains for the preparation of butter and cheese.

In milking and in the further handling and working up of the milk, it is sought as far as possible to conform to hygienic rules. The stables are arranged with a view to keeping the cows clean and the milk as wholesome as possible. While formerly in some stables the dung was allowed to remain under the cattle, now the Dutch system of stabling prevails, in which a gutter for the reception of the droppings runs along the back of the stalls and is cleaned out every day.

In order to judge whether the milk delivered by the cow-sheds has been obtained with due regard to cleanliness, the larger dairies test the milk of each farm daily for cleanliness. The reductase test is also frequently adopted, as it allows an opinion to be formed as to the number and kind of bacteria present in each consignment of milk.

With the object of meeting the just demand that all the milk put on the market be wholesome and above all free from tubercle bacilli, the East Prussian Dutch Herdbook Association adopted in 1900 suitable measures, being the first in the whole world to do so. In the East of Prussia this example was soon followed by cooperative dairies, control and cattle breeding associations, etc., so that in the above province at the present time no less than 82 000 animals above two years of age are submitted to the tuberculin test. The total number of animals (including young animals and calves) in the herds which are submitted to these measures is about 200 000.

From East Prussia the voluntary control of cattle tuberculosis spread to almost all the provinces and has also gained a sure footing abroad : in Holland, Russia, etc. The State control of tuberculosis is based chiefly upon the experience gained in East Prussia ; it came into force on May 1, 1912, in the new law on cattle diseases.

Some farms already use milking machines. Though it is undeniable that of late years they have been much improved, I am of opinion that they can never take the place of a good milker and can only be considered as a resource in time of need which is useful when no suitable hands can be engaged. It must not be forgotten that the high production of milk of our cows is not a gift of nature, but rather a quality which has been artificially induced in them to a great extent by the stimulus of hand milking. No milking machine is capable of handling an udder like an experienced milker, nor is it capable of considering the individuality of each animal. So important is this question, that all the efforts made in the several districts for the improvement of hand milking and the institution of milking schools should not be neglected but unweariedly furthered.

The so-called control associations, whose task it is to determine the quantity of milk produced by the individual cows of their members, and its fat content, together with the corresponding quantities of fodder consumed, have spread very rapidly. In the kingdom of Prussia there are at present about 500 such associations in existence, with a membership of 7 500 farmers, possessing 220 000 cows. That this system of control is one of the most powerful factors in the improvement of the milk yield of our cows is now generally recognized.

Among the various ways of utilizing milk, the direct consumption as human food has, during the last decades, increased considerably ; at present, as already stated, it accounts for 43 per cent. of all the milk produced. During late years a number of labourers' families have left the country, where they were provided with milk from the cows they kept, and have taken up their abode in large towns and industrial centres, remaining consumers of milk. Not only the absolute consumption of milk, but the relative consumption per inhabitant has increased, as is proved by statistics. As for the causes of this fact, they are to be sought in the anti-alcohol agitation which has reached the working classes ; in the successful propaganda for increasing the consumption of milk, which was started about 10 years ago, in the retail sale of milk in factories, schools and in the milk booths in the streets. and most of all in the higher wages of workmen and their better living. This increase of milk consumption is a matter of satisfaction, as it makes for the better and cheaper feeding of the people: the most valuable food stuff, protein, is four times as cheap in milk as in meat.

With the constant growth of large towns, the task of providing them with milk becomes increasingly difficult, as it has to be conveyed from greater distances. In such cases the milking is carried out with the utmoss cleanliness, the milk is immediately passed through a cottonwool filter and cooled to 1 to 3° C. (34 to 39° F). During carriage it is kept as cool as possible. None of the other proposed methods for preserving milk have proved advantageous in practice.

If, during the last ten years, the milk supply of large towns has so considerably improved, and the mortality of infants has sensibly diminished, it is to a great extent due to the fact that in large towns the sale of milk is carried on by large firms whose arrangements are in harmony with modern requirements and who earnestly strive to conform to the best of their ability to the dictates of hygiene ; all the herds which supply them with milk are submitted to the anti-tuberculous process recognized by the State, the milk on delivery is carefully examined as to its cleanliness, freshness, degree of acidity, fat content, etc. : it is cleaned by centrifugation, then pasteurized in order to destroy any germs of disease it may contain and to improve its keeping qualities, after which it is cooled by means of ice machines and kept at a low temperature till sent off. The consumer gets the milk sent to him in carts so constructed that any tampering with the milk by the carrier is rendered impossible. A certain amount of milk is sold in suitably closed bottles. As the great majority of our babies just in the most critical period of their existence are not suckled by their mothers but nourished on cows' milk, it is of the highest economic importance that this food should reach the consumer in the best possible condition, and this can only be accomplished by well appointed large firms, which thus act as institutions for the protection of babies.

In the working up of milk the first thing to be noted is that the improvement of milk separators, which are the most important dairy machines, is being continously and actively pursued. The number of separators at work in Germany is over 370 000. They are to be met with not only where butter is made, but also in many farms which send the separated cream to the dairies. This production of cream has spread, especially in those districts where large estates are prevalent. In the large butter factories all the improved methods suggested by science and practice are adopted ;

the cream is pasteurized in order to improve the quality and keeping of the butter and to obviate the unfavourable influence of certain fodders; the factories start it with pure cultures of lactic acid bacteria and cause the acidification to take place in so-called cream ripeners, which allow the temperature to be regulated to a nicety; they use churns in which the butter is made and worked up, and with which even large firms can churn all their cream in one operation, as in the largest of these churns (Butterfertiger) as much as 440 gallons of cream can be worked at a time. Apart from other advantages, they lead also to a great saving of time and labour.

The efforts of the dairies to improve the quality of their product are all the more satisfactory as foreign competition becomes keener every year, so that in many quarters the demand arises for the introduction of a trade mark for home butter. The granting of a patent for the "Friwi" butter-making process has caused dissatisfaction in the trade; this process consists essentially in maintaining the cream about 24 hours near freezing point, then warming it to 18 or 20° C. (64 to 68° F.) and mixing it with 10 per cent. of starter; this addition is repeated after 4 to 6 hours and then the cream is cooled to 10 to 13° C. (50 to 55°F.) and allowed to ripen at this temperature for about 18 or 20 hours, so that it is 48 hours old when it is churned. It seems difficult to understand how a process so long known could have been patented. As it does not lead to a greater yield of butter, it is not likely that many dairies would be inclined to pay royalties for it.

In cheese making also notable progress has been made, but this branch of dairying has not undergone so deep a change as butter making. Of the hundreds of dairies which have arisen during the last decades, only a relatively small number makes cheeses, because this industry is attended with greater risks; it is also more exacting as to the composition of the milk, it requires more labour and pains, greater knowledge and experience and lastly its products are not immediately saleable like butter.

In North Germany it is only in a few localities that many cheese dairies are to be found; such are the fertile plains of East and West Prussia and the Rhine province. During recent decades more interest has been awakened in cheese making in Schleswig-Holstein than was formerly the case. In the rest of Germany cheese dairies are found isolated. In South Germany any cheese making is much more important, especially in Bavarian Allgäu.

In West and Central Germany there are a number of curd cheese (Quargkäse) factories; these, however, are not considered as real cheese dairies because they only buy the freshly pressed curd from the dairies and work it up into several kinds of sour cheeses. Though these cheeses have only a low value, they are not to be despised as food for the people. It is further worthy of mention that the production of imitations of French soft cheeses, such as Camembert, Brie and Neufchâtel, is increasingly practised; as in these cheeses the milk fetches high prices it is a tendency to be welcomed. Considering that a dishonest competition has made itself felt in the cheese trade, efforts are being made to prevent cheeses made from skimmed milk being sold as half-fat cheeses, or these latter as whole-milk or cream cheeses.

The preparation of milk powder or dried milk, which has been known since the middle of the last century, has developed of late years, especially in East Prussia. It is connected with the rapid rise of the chocolate industry, as the dried milk is chiefly used in the preparation of milk-chocolate, cakes and biscuits, besides being used in the household for puddings. It is, however, no substitute for fresh milk as its makers claim. In this respect it is decidedly inferior to condensed milk, which next to butter and cheese is the most important milk product and serves especially for consumption on board ship and in the tropics. Unfortunately, it is still produced only in small quantities in Germany. As in condensing milk only a portion of the water is subtracted, the casein has not lost its power of dissolving in water, so that this product, by the mere addition of water, can be reconverted into milk. It can thus be utilized in many more ways than milk powder and has an immensely larger market ready for it, while the rapidly increased production of milk powder seems to have already outpaced the demand.

Recently the extraction of casein from skimmed milk has somewhat increased. It is used in the industries and also in the preparation of articles of food. Among the former, paper, colours and adhesives are the chief; when treated with metal salts and formaldehyde, galalith is the result; this, according to the substances added, gives a good imitation of celluloid, ivory, coral, tortoiseshell, etc. It is easily worked and polished and is not inflammable like celluloid. From casein, artificial silk and horsehair, films and shoe creams are made. Besides the above, a whole series of food preparations are based on casein: nutrose, eukasin, sanose, sanatogen, plasmon, eulactol, etc., which are sold at disproportionally high prices; thus for instance one pound of sanatogen costs 13*s* 4*d*.

From skimmed milk a substitute for Liebig's extract of meat can also be made; the process is based on the fact that in the ash of milk the same substances are found as in meat. Hitherto, however, this process has not been applied to any great extent. A few dairies prepare milk soap from condensed skimmed milk.

Some large cheese factories find it profitable to extract the milk sugar contained in their whey; this sugar is used in the preparation of medicines, in the nourishement of infants and in the industries. One factory prepares lactic acid from whey.

To the formerly known lactic acid beverages, kéfir and kumiss, another has lately been added, namely yoghurt. The use of this has spread very much, as it is credited with preventing infection of the intestines and being consequently conducive to health. Yoghurt, as is well known, is the national beverage of the Bulgarians. As a proof that the daily regular use of Yoghurt is especially wholesome, it is stated that in Bulgaria with its 4.3 million inhabitants there are more nonagenarians than in the whole of the German Empire.

That dairying in Germany is in a most flourishing condition, that it has already achieved extraordinary progress and that this is due to the unceasing activity of dairy advisers, teachers and experts, is admitted by every one. What investigators in this field justly complain of is the want of a sufficiently endowed central institute capable of solving several serious problems. Institutes existing at present cannot cope with many questions, being handicapped by want of time, of sufficient staff, of experimental stabling and cattle, of a dairy entirely at the disposal of investigators, and, last but not least, by the want of money. This want is all the more to be regretted as other agricultural industries such as brewing, distilling, starch and wine making, beet sugar manufacturing and milling, which, more than dairying, have emancipated themselves from farming, have possessed for a long time past such central institutes, notwithstanding that the value of their produce is considerably less than that of dairying. Much smaller States, such as Holland, Sweden, Switzerland and several States of the North American Republic, are in this respect much better off than Germany. The demand for an imperial institute for dairying will have to be regarded as completely justified.

SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

1313 – **Swiss Law of June 9, 1913, concerning the Control of the Commerce in Manures, Feeding Stuffs, Seeds and other Products useful to Agriculture and Allied Industries, by the Federal Stations of Agricultural Experiment and Analysis.** (Verordnung betreffend die Ueberwachung des Handels mit Dungemitteln, Futtergemitteln, Sämereien und andern in der Landwirtschaft und deren Nebengewerben Verwendung findenden Hilfsstoffen durch die Schweizerischen Landwirtschaftlichen Versuchs-und Untersuchungsanstalgten — Vom 9 Juni 1913. — SCHULTHESS (Département fédéral de l'Agriculture). — *Landwirtschaftliches Jahrbuch der Schweiz*, Year XXVII, Part 5, pp. 309-324. Berne, 1913.

The Commission of Control of the Stations of Agricultural Experiments and Analyses of the Federal Department of Agriculture has considered and approved a law for the control of the trade in feeding-stuffs and manures. This law will come into force on the first of January 1914 and will supersede the law of the tenth of June 1903.

The chief points dealt with are as follows:

General Provisions:
- § 1. Firms under control and their certificates of guarantee.
- § 2. Procedure required for certification.

Special Provisions:
- *A.* Inspection of trade in manures, forage crops and other materials.

I. *Control analyses.*
- § 3. Control fees.
- § 4. Guarantees.
- § 5. Gratuitous analyses. Control certificates.
- § 6. Drawing and despatch of samples.
- § 7. Results of analysis.
- § 8. Appeals.
- § 9. Indemnities.

II. *Other Analyses.*
  § 10. Despatch of samples.
  § 11. Scale of charges.
  § 12. Reduction of prices.
  B. Protection of trade in seeds.
I. *Control Analyses.*
  § 13 Control Fees.
  § 14. Guarantees.
  § 15. Gratuitous analyses. Control certificates.
  § 16. Drawing and despatch of samples.
  § 17. Results of analysis.
  § 18. Appeals.
  § 19. Indemnities.
  § 20. Selectors and establishments for seed-selection in Switzerland.
II. *Other Analyses.*
  § 21. Despatch of samples.
  § 22. Scale of charges.
  § 23. Reduction of prices.
  C. Conference of experts on questions connected with the Control.
  § 24. Aim.
  § 25. Composition.
  § 26. Powers.

This law concerns chiefly manufacturers, companies, merchants and persons with an interest in the control certificates. Its provisions are effected by the Central Administration of Swiss Stations of Agricultural Experiments and Analyses at Liebefeld, near Berne, with the object of controlling the trade in manures, fodder and other materials used in agriculture. The firms which reap the advantages shall be known as "controlled firms" (1).

The conditions of the contract are as follows :

(*a*) Controlled firms undertake to observe in every point the provisions of the law.

(*b*) They undertake to indicate, in compliance with the law, the guarantees of all goods sold, and to deliver gratuitously to their customers the certificate of control filled in according to instructions.

(*c*) The purchasers of goods from a controlled firm have the right to a gratuitous analysis from the Federal authorities above-mentioned, under the conditions stipulated in the law and without further formalities.

(*d*) The controlled firms shall recognise the analyses made by the authorities as final for regulating the price for the purchasers except in the case of appeal ; when the analysis shows composition inferior to that guaranteed, they shall indemnify the purchaser.

The controlled firms shall undertake to describe their products and are forbidden to use names likely to lead to a misunderstanding of their real value on the part of the purchaser. They are also forbidden to put on the market products of secret composition. Each year the Administration will publish a list of the firms controlled and the products sold by them. Firms which do not submit to regular control or continue to place inferior products on the market will be removed from this list. (See § 1).

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(1) This principle is already in force in several of the United States of America, and is incorporated in the "Model Fertilizer Law" proposed by Hopkins and conforming to the views of the Association of American Agricultural Colleges and Experiment Stations. (See *Proceedings XII Annual Convention*, p. 128, 1906 ; *Proceedings XXIV Convention of the Association of Official Agricultural Chemists*, p. 100, 1907, and HOPKINS, C. G., *Soil Fertility and Permanent Agriculture*, Appendix, p. 599, 1910). (*Ed.*).

The annual revenue of the control service is estimated on a basis of every 10 metric tons of produce sold to purchasers resident in Switzerland at the rate of 1.50 frs. (1*s* 3*d*) for manures containing a single fertilising ingredient and 2.50 frs. (2*s*) for mixed manures and feeding-stuffs, with a minimum of 50 francs (£2) in the case of Swiss firms. On foreign firms the taxes are respectively 2.50 (2*s*) and 3 frs. (2*s* 6*d*), and the minimum 100 francs (£4). The annual amount due must be paid before January 10 of the following year, reduction of 20 per cent. being allowed for quantities exceeding 500 wagons. In the case of seeds the annual control tax will be fixed by contract, the minimum being 25 francs (£1) for Swiss firms and 50 frs. (£2) for foreign firms, the amount to be paid in advance. (See § 3 and § 13).

The guarantees given by the controlled firms for goods sold must comprise:

In the case of manures :

(*a*) Purity and freedom from adulterations ; suitability of texture.

(*b*) Freedom from substances injurious to plants.

(*c*) The content of useful constituents, indicated as percentage, when the purchase of the goods is not made on the results of the analysis.

The guarantees of quality and composition refer to:

water-soluble phosphoric acid (P_2O_5) ;
ammonium-citrate soluble phosphoric acid (P_2O_5) ;
citric-acid soluble phosphoric acid (P_2O_5) ;
nitrogen as ammonia (N) ;
nitric nitrogen (N) ;
organic nitrogen (N) ;
total nitrogen (N) ;
water-soluble potash (K_2O) ;
lime (CaO) ;
other substances as required ;
the fineness of grinding ;
suitability for spreading ; degree of dryness and physical condition (fine or coarse).

The minimum composition must be:

superphosphates : 10 per cent. water-soluble phosphoric acid.
mixed superphosphates : 4 per cent. water-soluble phosphoric acid.
mixed nitrogenous manures : 1 per cent. nitrogen (in a form which must be indicated).
mixed potash manure : 2 per cent. water-soluble potash.

In the case of ammonium-citrate soluble phosphoric acid of mixed or double superphosphates, and also in the case of the undissolved phosphoric acid of bone superphosphate, the guarantee must be at least 2 per cent. For mineral superphosphates only the water-soluble phosphoric acid is guaranteed.

Feeding-stuffs :

(*a*) Genuineness, purity and freedom from adulteration.

(*b*) Good keeping qualities, absence of injurious substances; the normal constitution of the food.

(*c*) In the case of oil-cakes, cake-meals and other concentrated foods, amounts of protein and fat contained ; in the case of molasses the percentage of sugar and the nature of the product ; in the case of dried foods such as potato flakes, the percentage of dried substance; in the case of phosphates of lime to be used as food the percentage of ammonium-citrate-soluble phosphoric acid.

For other feeding-stuffs, and in the case of wagon-loads of the foods mentioned under (*c*), the guarantees shall be fixed by agreement with the buyer. In the case of feeding meals and other starchy foods the vendor may guarantee the percentage of starch.

Other Substances used in Agriculture :

For sulphur, sulphate of copper, sulphate of iron, etc., the guarantee, besides genuineness, purity and normal composition, must refer to the active substance. (See § 4).

Seeds :

1) A minimum percentage of authentic and pure seeds, and the source of the seeds.

2) A minimum percentage of authentic seeds, and a definite germinating capacity.

3) The freedom from dodder (*Cuscuta* spp.) of all leguminous seeds, such as clover, lucerne, birds-foot trefoil, melilot, etc.

4) The freedom from flax dodder (*Cuscuta Epilinum*) of flax and spurrey.

5) The percentage of burnet (*Poterium Sanguisorba*) in sainfoin.

6) By special agreement between the parties, the firms shall guarantee the freedom from other injurious seeds, such as dock (*Rumex*).

7) The guarantee of purity and germinating power to be expressed as percentages of the total weight ; thus the vendor guarantees the number of kgs. of authentic and pure seeds. (purity) present as a minimum in 100 kgs. of the goods, and the minimum of seeds capable of germination in 100 pure seeds (germination capacity).

8) The controlled firm must guarantee all goods sold, even if their exact quality and composition is not known ; in this case the vendor and the purchaser fix beforehand the price of 1 kg. of pure seed capable of germination, and the seed is paid for according to the results of analysis.

9) Also in the case of sale on sample, the purchaser must send to the Control Station a sample of the seed offered and of the actual goods delivered.

In order to establish the identity and genuineness of seeds difficult to identify, such as the different species of *Brassica*, *Trifolium*, *Medicago*, the Control Station carries out culture tests, the results of which are considered final. The vendor must give guarantees to this effect. (See § 14).

The practical application of the law is effected by means of "control certificates ".

Control analyses of manures and feeding-stuffs are made gratuitously, according to agreement with the controlled firms, on the following conditions :

(*a*) that it is shown by a certificate of origin that the goods are the product of a controlled firm;

(*b*) in the case of one class of goods the purchase value must be at least 50 frs (£ 2) except for quantities in excess of 500 kg. (10 cwt).

(*c*) The drawing and despatch of samples must be made according to prescriptions

The controlled firms must enter in the certificates of gratuitous analysis (on printed forms supplied free by the Central Administration) the following particulars:

(*a*) name and address of the purchaser;

(*b*) name and stamp of the controlled firm, and, if necessary, also the name of its representative;

(*c*) date of despatch of the goods from the firm;

(*d*) exact description and weight of the goods, and the price if the weight does not exceed 500 kg (10 cwt);

(*e*) number of wagon, in the case of full wagon-loads;

(*f*) the guaranteed percentage of the goods as sent out, and not of the dry substance (See § 5)

The sampling must be carried out either by the authorities or by the purchaser or his agent, in the presence of the vendor or an impartial witness, in enjoyment of civil rights and acquainted with the provisions of the law. The despatch of the sample should not take place more than three days after the arrival of the goods.

The following instructions are given for obtaining an average sample. In the case of manures and feeding stuffs, samples of at least 2 kg. (4 ½ lbs.) should be taken from the sacks, barrels, boxes, etc. (if possible with a sampling tool). A partial sample must be taken from every tenth sack, barrel, box, etc., or if the consignment comprises less than 50 packages, then from at least every fifth package; if there are less than five packages, each one should be sampled. The samples should be taken from different parts of the mass, and not only from the surface. They should not be taken from sacks whose contents have deteriorated or become damp in transport. If the goods are in a heap, the sample must be taken from in the mass, and not from the surface. These partial samples must be carefully mixed on a clean dry surface and all lumps should be broken up. From this mixed mass three clean and dry wide-mouthed bottles of about ½ kg. (1 lb.) capacity must be filled immediately; they must be corked and sealed with wax or lead; the seal and dies must not be available to the purchaser. In the case of cattle cakes, six must be taken from various places and reduced to pieces of the size of nuts. In the case of dry foods, samples must be packed in clean tin boxes, or in wooden or cardboard boxes. If the consignment comprises several wagons, samples must be taken from each wagon. Lastly, if various parts of the consignment show damage, separate samples should be taken from them. In every case one of the three samples is to be sent to the Station with the free certificate of control, while the other two (reserve samples) are retained by the purchaser.

The samples for analysis should be sent post-free to the Federal Stations of Agricultural Chemistry of Zürich, Berne or Lausanne, according to the district. (See § 6).

With regard to seeds, control analyses are made gratuitously according to the following conditions (see § 15):

(*a*) for every one variety the minimum quantity purchased must be 5 kg (11 lbs.), except for market-garden crops, for which it is 1 kg (2 ¼ lbs), and cereals for which it is 25 kg. (55 lbs.);

(*b*) that it is shown by a certificate of origin that the goods are the product of a controlled firm.

(*c*) the drawing and despatch of the sample to be according to the prescription

The drawing of the samples is carried out in the same manner as for manures and feeding stuffs, except that the mean sample is taken from the whole bulk, carefully mixed, of each variety. When it would be impossible or would take too long to mix the lot, samples should be taken from various parts of each sack and carefully mixed. Samples must be sent in a strong paper bag closed with sealing-wax or lead. The samples are sent post free in minimum quantities as follows: grasses and similar seeds, 50 gms. (nearly 2 oz.); clovers, seeds of conifers, beets and similar seeds, 100 gms. (3 ½ oz.); cereals, sainfoin and other large grains, 250 gms. (9 oz.). For determinations of the weight per unit-volume: samples of oats and bearded grains, 1 ¼ l. (just over 1 quart); of other seeds, ½ l. (nearly 1 pint). Samples are sent post-free to the Seed Control Station at Lausanne or to that at Zürich. (See § 16).

The guarantees are certified by the results of the analyses which are sent free by post to both parties, or by telegram or telephone at the expense of the party requesting it. Both parties can appeal against the results on the grounds of defective analysis, defective sampling, or unevenness of consignment not allowing agreement with the samples analysed although the analysis be correct. Analysis of one of the reserve samples is made by the same Station, and a decisive analysis by the other, the expenses to be paid by the defaulting party. (See §§ 7, 8, 17, 18).

If the analysis shows a defective composition, the purchaser is entitled to return the goods and to repayment of the purchase-money together with costs and compensation. If the percentage composition is below the standard, the controlled firm must refund the difference in value. The following variations in percentage composition are allowed:

For manures:

Water-soluble or total phosphoric acid	0.5 %
Citric-acid or ammonium-citrate soluble phosphoric acid	0.75
Nitrogen in manures containing less than 5 per cent	0.3
Nitrogen in manures containing 5 per cent and more	0.5
Potash	0.5
Fineness of grinding of basic slag	5.0
Calcium sulphate	2.0
Calcium carbonate	2.0

For feeding-stuffs:

Crude protein	2.0
Crude fat	0.5
Sugar in molasses feeds	2.0
Starch	2.0
Presence of earthy matter in cakes and cake meals, except in the case of agreement between the parties	2.0
Presence of lumps in cakes and cake meals, except in the case of agreement between the parties	2.0

When the above variations are exceeded, the compensation must be calculated on the total difference in the percentages guaranteed and the results of analysis, except in certain special cases. (See § 9).

The variation allowed in the case of seeds is fixed at 5 per cent. of the value of utilisation calculated according to the formula $\frac{G \times P}{100}$, where P represents the purity and G the germinating capacity. Special conditions are imposed for the presence of dodder in clover and of burnet in sainfoin. (See § 19).

For analyses of soils, manures, seeds and other products, a special discount of 50 per cent. on the established charges is allowed to Swiss Stations of Agriculture and Forestry, and to agricultural authorities, societies and syndicates, as well as to Swiss farmers requiring analyses for their own use.

Seed selection firms selling their products in Switzerland are partially or totally exempt from the expenses of control, if they submit to the conditions imposed on controlled firms and sell at least 250 kg. (550 lbs.) of cereals or other large seeds and at least 25 kg. (55 lbs.) of seeds of beets, clover, grasses and others. The Experimental Stations have further the right to inspect fields or stations for selection, and to exclude seeds which do not conform to the conditions (See § 20).

Finally, the Federal Department of Agriculture, responsible for the carrying out of this law, is assisted in this work by the Control Commission of the Federal Stations of Agricultural Experiments and Analyses. It may also summon special congresses of experts for the discussion of questions raised in the carrying out of the law. The constitution of the congress is normally as follows: the members of the Commission of Control; the Central Administration and the chiefs of Federal Stations of Agricultural Experiments and Analyses; the representatives of controlled firms. The particular members of any one conference will be nominated according to the subject under discussion.

The special subjects for discussion will be:

1. Definition of terms, such as purity, genuineness, freedom from adulteration, products of secret composition.
2. Exact description of the goods.
3. Determination of the rules concerning quality, guarantee and control of goods, especially new products.

4. Calculation of compensation for goods below analysis delivered by controlled firms; determination of various points concerning the price of certain active principles.

5. Examination of differences between controlled firms and Federal Stations of Agricultural Experiments and Analyses concerning questions relative to manufacture, to the trade and to the calculation of compensation. (See §§ 24, 25, 26).

1314 – **Reorganization of the Superior Council of Agriculture in France.** — Décret du 15 juillet 1913, portant réorganization du conseil supérieur de l'agriculture. — *Bulletin de la Société des Agriculteurs de France*, Year 1913, No. of Sept. 1, pp. 143-144. Paris, September 1, 1913.

According to the text of the Decree of July 15, 1913, concerning the reorganization of the Superior Council of Agriculture in France, the council in question shall give its advice on all problems proposed by the Ministry of Agriculture and which particularly concern agricultural legislation, measures for the encouragement of agricultural production, questions of agricultural sociology, political economy, duties and import tariffs.

The members of the Council shall consist of three kinds: *ex officio* members, elected members and members nominated by ministerial decree. The *ex officio* members are the presidents of the Agricultural Commissions of the senate, and of the Chamber, the general directors and heads of divisions of the different branches of the ministerial administration. The Academy of Sciences and agricultural associations elect one of their members as a representative to the Council, and the 12 external services connected with the Ministry of Agriculture also each elect one of their officers as a representative. The Minister also nominates 60 members chosen for their distinguished work in pure or applied agricultural science, and 25 members distinguished in the economic and social services. The members are elected or nominated for three years and are indefinitely re-eligible.

The Council assembles at least once a year under the presidence of the Minister of Agriculture, who convenes the assembly.

The Council has the right to elect a Permanent Commission composed of the *ex officio* members and 25 others, of whom 10 are elected by ballot and the rest nominated by the Minister.

1315 – **Law and Regulations rendering Attendance at Local Extension Schools Obligatory in the Provinces of Brandenburg, Pomerania, Saxony, Schleswig-Holstein, Westphalia, in the Rhine Province and in Hohenzollern Territory.** — *Ministerialblatt der Königlich Preussischen Verwaltung für Landwirtschaft Domänen und Forsten*, Year 9, No. 10, pp. 303-309. Berlin, October 1913.

The present law of May 19, 1913, confers on the communes of the above-named provinces the right to render by means of communal decree, the attendance at a local extension school during three consecutive winter half-years compulsory on all male persons under 18 years of age and no longer under obligatory attendance at other schools. This right existed already in the provinces of Hesse-Nassau, Hanover and Silesia.

The regulation attached to this law gives details as to the persons subject to this compulsion and as to the curriculum and general plan of instruction of these local extension schools; it contains, in an appendix, the draft of a communal decree regarding these schools.

1316 - **Position and Conditions of the Prussian Rural Continuation Schools during the Financial Year 1912** (1). — *Zeitschrift für das ländliche Fortbildungsschulwesen in Preussen*, Year 5, Part 1, pp. 1-19. Berlin, October 1913.

In the year 1912 there existed in the kingdom of Prussia 6191 rural continuation schools. Of this number, 265 were instituted by districts (Kreise), 4610 by communes, 32 by Agricultural Associations and 1284 by private persons and other agencies. The expenses entailed by these schools were defrayed in the case of 11 by the districts alone, in that of 20 by the communes alone; by the State alone in 1843 cases, by the State in conjunction with other interested parties in 4263 and by private persons and other agencies in 47. The number of self-supporting schools was seven.

The total cash expenses, not including upkeep, heating and lighting and cleaning the schools, amounted to £ 50 360.

The number of pupils was 98315. that of the teachers 8587. Of the latter, 8137 were elementary school teachers Of the schools, 6092 were open only in winter, 99 throughout the year.

As compared with the preceding year 1911, the number of these continuation schools has risen in the whole State of Prussia from 5349 to 6191.The total number of pupils rose from 86689 to 98 315. In 1911 the average number of pupils per school was 16.2 and in 1912, 15.9. For next year also a further considerable increase in the numbers of schools and of scholars, especially the latter, is expected in consequence of the law of of May 19, 1913. (2).

1317 - **Practical Schools of Agriculture in Uruguay.** — OTAMENDI, JOSÉ in *Revista del Ministerio de Industrias*, Year 1, No. 2, pp 57-64 and No 3, pp. 37-66. Montevideo, June and July 1913.

In this paper the writer makes some suggestions as to the methods to be followed in teaching in the practical schools of agriculture founded at Paysandu, Salto and Cerro Largo by the law of September 1911. His suggestions deal with the general and special trend of the farms attached to the schools, respecting the farming, live stock keeping, wine-making, fruit-growing, market gardening and agricultural industries. He draws up a detailed plan for institution of agricultural experimentation on crops, live stock, agricultural chemistry and so forth, and on the observations to be made on the economic conditions of the agriculture of the country (conditions of land tenure and production, means of transport, colonisation, immigration, and agricultural credit).

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(1) See No. 2, *B* Jan. 1913. (*Ed.*).

(2) See preceding article (No. 1315). (*Ed.*).

1318 - Local Extension Schools and Agricultural Winter Schools. — BISCHOFF, KURT in *Das Land*, Year 22, No 1, pp 3 6 Berlin, October 1, 1913

Observations on the aims and tasks, object and manner of teaching, preparation of the teachers of the local extension schools and of the agricultural winter schools, and the relative position of these schools to each other.

1319 - Agricultural Show .

AGRICULTURAL SHOWS AND CONGRESSES

Australia : Queensland.

1914. Feb. 4-6. Stanthorpe — Agricultural show

France.

1914. Jan. 30-Feb. 3. Paris. — Fifteenth International Poultry Show, organized by the " Société des Aviculteurs français ". Address : 46, rue du Bac, Paris.

Feb. 16-26. Paris, Grand Palais des Champs Elysées. — General agricultural show, including : 1) fat cattle, sheep and pigs ; 2) fat poultry ; 3) live poultry and rabbits ; 4) dairy produce (butter and cheese); 5) agricultural and horticultural produce; 6) wines, ciders, perries and brandy ; 7) work dealing with agricultural mutuality; 8) exhibition of materials (packing and poultry). To this show will be annexed an exhibition of instruments, machines and apparatus for mechanical cultivation to be held at the " Esplanade des Invalides ", Feb. 16-25. Programmes may be obtained from the Ministry of Agriculture, 78, rue de Varennes, Paris.

May 1- Nov. 1. Lyons. — International Urban Exhibition, with section reserved for silk and silk goods.

June. Paris. — General show of breeding stock : cattle, sheep, pigs and sheep-dogs.

Germany.

1914. May 21-24. Birnbaum (Posen). — Agricultural show.

June 11-17. Stettin. — Great agricultural show ; live stock section closes June 14.

June 19-22. Stettin. — Provincial show organized by the Chamber of Agriculture. Will include agricultural and dairy produce and machines and utensils.

June 27-29. Trebnitz (Silesia). — Live stock show. A show of agricultural machines and utensils and of agricultural and horticultural produce will be annexed.

Autumn. Sesslach (Upper Franconia). — Live stock show of the district, and exhibition of agricultural implements.

Paraguay.

1914. May. — The Live Stock Department of the Government, in conjunction with the "Banco Agricolo ", is organizing a show and sale of cattle, chiefly with the object of encouraging foreign breeders to introduce choice stock into the Republic.

Russia.

1914. Sept. 6-9 (Aug. 24-27 old style). Mitau (Courland). — Agricultural show organized by the " Kurländische Oekonomische Gesellschaft in Mitau ". Will probably be held yearly about this date. Address to : " Geschäftsstelle der Ständigen Ausstellungskommission ", Berlin, N. W., Roonstrasse, 1.

Spain.

1914. May. Tortosa. — International agricultural show, and congress of the " Federación Agricola Catalana Balear ".

Sweden.

1914. June 15-21. Malmö.— Agricultural Show for Scania, to celebrate the centenary of the foundation of the Agricultural Societies of Malmöhus and Kristianstad. General secretary : G. Leufvén, Malmö.

Switzerland.

1915. Geneva. — Estella Competition (International) for new plants, on the occasion of the 60th anniversary of the foundation of the Geneva Horticultural Society.

United Kingdom.

1914. March 10-12. London. — Spring show of the Hunters Improvement and National Light Horse Breeding Society.

June 4-16. London, Olympia. — International Horse Show. Sec.: Frank F. Euren, 12 Hanover Square, London, W.

June 30-July 4. Shrewsbury. — Show of the Royal Agricultural Society of England.

July 14-17. Hawick (Scotland). — Show of the Highland and Agricultural Society.

United States.

1914. Feb. 10-24. Dallas, Texas. — National Corn Exposition.

1915. San Francisco. — International Live Stock Show (Section of the Panama-Pacific Exhibition). The prizes in the live stock section will amount to $ 175 000, as follows: horses, $ 50 000; cattle, $ 50 000; sheep and goats, $ 25 000; pigs, $ 25 000; poultry, etc., $ 12 500; car-loads of live stock, $ 7 500; dogs and cats, $ 5 000. Additional prizes amounting to $ 100 000 will be given by a number of American societies. The dates are not yet definitely fixed, but the following is the probable arrangement:

	Date of show	Last date for entries
Horses, asses, mules	Oct. 1-12	Sept. 1
Cattle	Oct. 24-25	Sept. 10
Sheep, goats, pigs	Oct. 27-Nov. 4	Sept. 15
Poultry, etc.	Nov. 15-17	Sept. 20
Car-loads of animals	Nov. 8-12	Oct. 1
Cats	Nov. 21-24	

1320 – Agricultural Congresses.

1914. Berne. — International Tuberculosis Conference.

1914. Feb. 17-19. Paris. — Congress of the "Société nationale d'encouragement à l'agriculture".

1914. April 14-17. Paris, Sorbonne. — Fifty-second Annual Congress of the Learned Societies of Paris and the Departments, under the patronage of the Minister of Public Instruction.

1915. Christiania. — International Tuberculosis Conference.

CROPS AND CULTIVATION.

AGRICULTURAL METEOROLOGY

1321 - The Distribution of Atmospheric Impurities in the Neighbourhood of an Industrial City.

— CROWTHER, C. and STEUART, D. W. in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 391-408. Cambridge, October 1913.

During the twelve months July 1911 to July 1912, samples of rain-water were collected at 14 different points within and surrounding the city of Leeds as a means of estimating the relation between the purity of the atmosphere and the degree of pollution of the rain-water. The stations were so arranged as to give a complete ring of stations on a circle of three miles radius from the centre of the city, whilst to the north, north-east and east additional stations were selected at distances of five miles and seven miles respectively from the centre. Leeds is bordered in all directions except the three above mentioned by a thickly populated industrial area, coal-mining and iron -working prevailing to the south-east and south, and woollen manufacturing to the south-west and west, whilst large engineering works are situated throughout both areas. Little was to be gained therefore by collecting samples more than three miles out in these directions, since the existence of heavy and varied pollution would almost hopelessly complicate the interpretation of results.

The following table summarises the analyses of rain-water.

Collecting station	Rainfall inches	Lbs. per acre.			
		Total suspended matters	Sulphur expressed as SO_3	Chorine	Nitrogen
N. 7*	33.2	72	128	44	6.7
N. 5	33.1	104	192	59	9.1
N. 3.	30.1	175	218	53	5.9
N.E. 7	31.0	126	162	46	6.6
N.E. 5	29.4	150	168	43	9.1
N.E. 3	30.5	120	186	45	8.5
E. 7.	29.1	122	168	43	6.6
E. 5.	28.7	212	171	50	8.0
E. 3.	27.8	200	207	54	7.9
S.E. 3.	25.8	353	357	63	8.9
S. 3	28.2	286	269	47	9.3
S.W. 3.	32.7	239	268	56	8.0
W. 3	30.4	292	284	56	8.7
N.W. 3.	28.3	194	380	70	7.4

* N. 7 = station 7 miles to the north, etc...

The rainfall shows a variation of 20 per cent., and is highest on the hilly side of the city, to the west and to the north.

The total suspended matters and the sulphur in the rain water together form a very good indicator of the degree of air pollution. Considering these substances first: in the above table all stations on the three-mile ring show high figures and the more pronouncedly industrial districts (S. E. 3, etc.) are higher than the districts lying to the north and north-east. Further, there is a sharp falling off in pollution on passing away from the city northwards or north-eastwards but a much more gradual fall in passing eastwards, owing to the influence of the prevailing westerly winds, although there is a certain degree of complication in that this easterly line of stations is situated just on the northern fringe of the coal-mining area; lastly, stations even seven miles out in the cleanest direction show a very polluted atmosphere.

Chlorine, on the other hand, does not appear so reliable a guide as sulphur, and the nitrogen figures are liable to be influenced by external factors, such as leaves, bird droppings, etc. ; but they too show the same general tendency to be higher in the industrial districts.

The percentage of tar in the suspended matter, of organic nitrogen in the total nitrogen, and of sulphate in the total sulphur, indicate in a general way that the smoke though greater in quantity is in a higher state of oxidation in the dirtier or more industrial districts, owing to more efficient combustion of the coal.

With regard to the effects of smoke on vegetation, no general effect upon the opening of tree buds could be detected, but throughout the polluted area to the south and to the west a considerable proportion of the leaves of trees were badly damaged before they had been expanded a month, while in the cleaner districts to the north and north-east no appreciable leaf damage could be detected at this period, and, as the season advanced, the damage became accentuated in the polluted areas.

Evidence was also obtained in confirmation of that adduced by earlier observers that the sulphur content of the leaves of trees may afford useful assistance in the diagnosis of smoke-pollution.

1322 - **The Correlation of Rainfall** — PECK, J. and SNOW, E. C. in *Quarterly Journal of the Royal Meteorological Society*, Vol. XXXIX, No. 168, pp. 307-316. London, October 1913.

The writers studied the rainfall data (in *British Rainfall*) for 30 stations in the southern and south-eastern part of England during the four years 1908-11 and they drew up series of correlation tables between the rainfall in each month of one year and that in every other month of the same year for each of the four years. Then grouping the correlations into smaller tables, they found that the correlation between winter months was considerably higher, than that between summer months, or between winter and summer months. Or, in other words, though yet far from being able to give accurate predictions for the rainfall in any month, it would appear that while the *relative* rainfall in December can be predicted from a knowledge of the rainfall in two or three of the previous months with a small degree of probability, that of June and July cannot be foretold with the slightest degree of probability.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

1323 - **The Movements of Soil Water in an Egyptian Cotton Field.** — BALLS, W. L. in *The Journal of Agricultural Science*, Vol V, Part 4, pp. 469-482. Cambridge, October 1913.

On a selected area (20 metres × 10 metres) situated in a field adjoining the Botanical Laboratory at Giza a series of soil samples was drawn every 20 cm. to a depth of 160 cm. during the five months: May 4 to September 21, 1912. The borings were made twice a week and the moisture content of the samples was estimated. A crop of Assili cotton was grown on the area and was planted and cultivated in the conventional manner, yielding an average crop for the land of about 500 lbs. of lint per acre. The size of the sampling area was purposely reduced in order to eliminate irregularities in the subsoil due to a sloping bed of clay, and the plot chosen was made up of the following layers:

Surface to 30 cm. deep	Made soil
30 cm. to 90 cm. »	Stiff clayey soil
90 cm. to 200 cm. »	Loam to sandy loam
Below 200 cm.	Stiff clayey soil

During the experimental period, irrigation water was applied four times to the land, *viz.* May 30, June 23, July 17, August 13.

The results of the analyses are tabulated and set out in the form of curves; taking the mean of the three borings made immediately after an irrigation and the mean of the next, the loss of water from the soil during five sub-periods is estimated as shown in Table I.

As the season advanced the region of maximum loss gradually descended to the deeper layers following the development of the root; then, in the middle of August, things were reversed, the water-table began to rise and masked the root-drying effect. Taking the specific gravity of the soil as 1, the total loss of water from the soil per day was calculated for each of the five sub-periods; basing his calculations on previous observations of soil evaporation and on all the other evidence at his command, the writer distinguished between the water evaporated directly from the soil and that transpired by the plant, and distributed the total loss as shown in Table II.

The result is only a rough approximation, but the very high figure obtained for the transpiration of cotton indicates that more water is required for the cotton crop alone than is available in the Nile during the summer, and that therefore the plants must draw on the subterranean water supply when it is within reach. It does not follow that the subterranean water, though utilizable, is of any advantage to the crop above. The existence of a water table within 3 metres of the surface still implies a limitation of the root-system, and a risk of submergence, with all its attendant evils.

The writer also concludes from his figures that the effect of the surface irrigation is felt to an indefinite depth in the same way that a rise in the water-table is noticeable well above the level of the latter owing to a general disturbance and redistribution of hydraulic pressure throughout

TABLE I.

Sub-period	Depth in cm.	Water per 100 dry soil							
		20	40	60	80	100	120	140	160
1	*A** May 4-11 . .	18.6	22.6	25.8	31.3	31.4	31.4	30.4	30.4
	B » 22-29 . .	7.7	20.3	25.5	29.4	26.9	29.3	29.4	30.2
	loss	10.9	2.3	0.3	1.9	4.5	2.1	1.0	0.2
2	*A* June 2- 8 . .	22.7	24.2	29.1	30.2	26.9	31.0	31.1	31.2
	B » 16-22 . .	7.2	12.0	25.1	30.1	20.3	29.2	31.3	31.2
	loss	15.5	12.2	4.0	0.1	6.6	1.8	0.0?	0.0
3	*A* June 26 . .	25.3	24.6	27.1	29.3	27.3	29.1	31.7	32.7
	B July 10-17 . .	16.3	16.5	15.5	19.5	25.1	27.6	32.0	33.6
	loss	9.0	8.1	11.6	9.8	2.2	1.5	+ 0.3	+ 0.9
4	*A* July 20-27 . .	25.9	23.4	21.3	24.2	27.8	30.3	31.8	30.4
	B Aug. 3- 7 . .	17.2	15.3	15.7	17.6	17.7	19.2	30.5	29.9
	loss	8.7	8.1	5.6	6.6	10.1	11.1	1.3	0.5
5	*A* Aug. 14-21 . .	27.7	23.6	31.7	19.8	21.2	26.3	30.6	30.7
	B Aug. 31-Sept. 7.	21.8	20.5	23.6	32.1	27.3	30.7	31.6	31.5
	loss	5.9	3.1	8.1	+ 12.3	+ 6.1	+ 4.4	+ 1.0	+ 0.8

[1] *A* = borings after irrigation.
B = » before »

TABLE II.

Sub-period	Total loss of water in tons per acre per day	Loss due to	
		soil evaporation	transpiration
1	11	7	4
2	24	10	14
3	25	4	21
4	36	2	34
5	+ 4	—	—

Mean transpiration = 18 tons of water per acre per day.

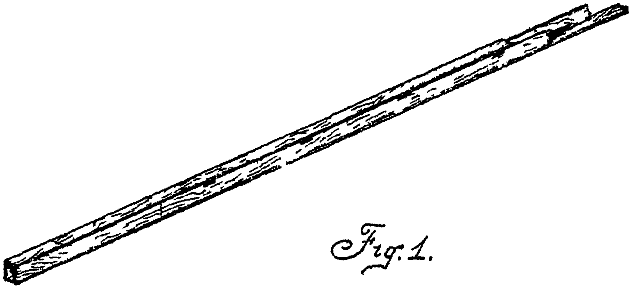


Fig. 1.

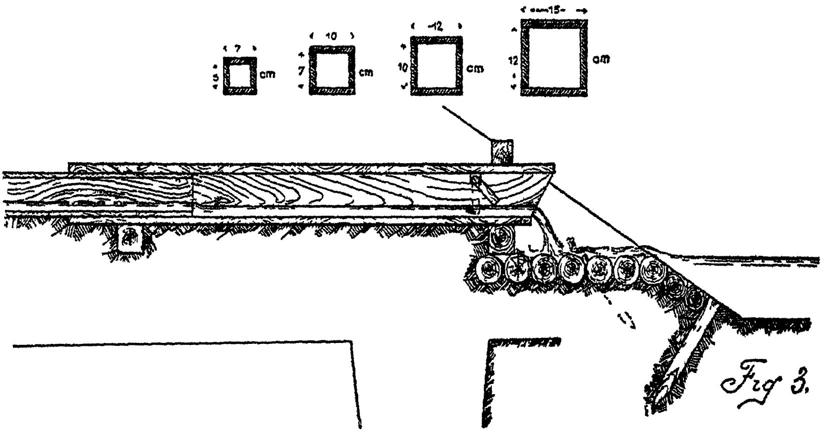


Fig 3.

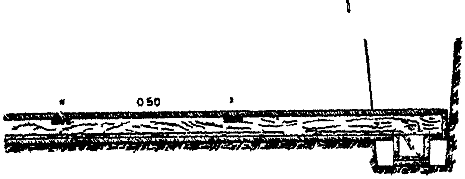


Fig 2

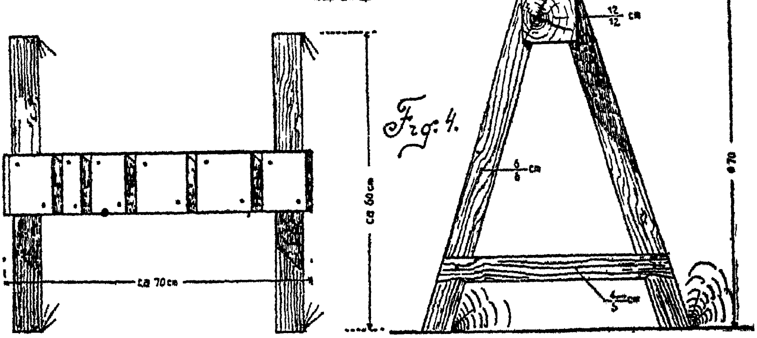
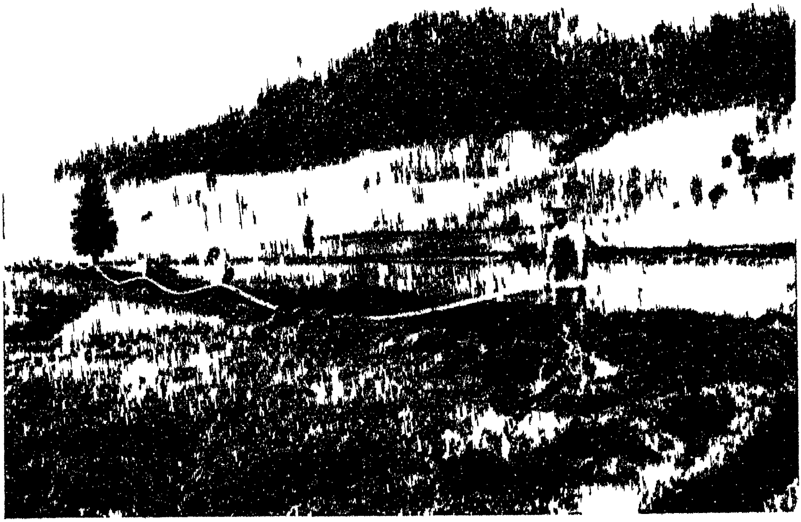
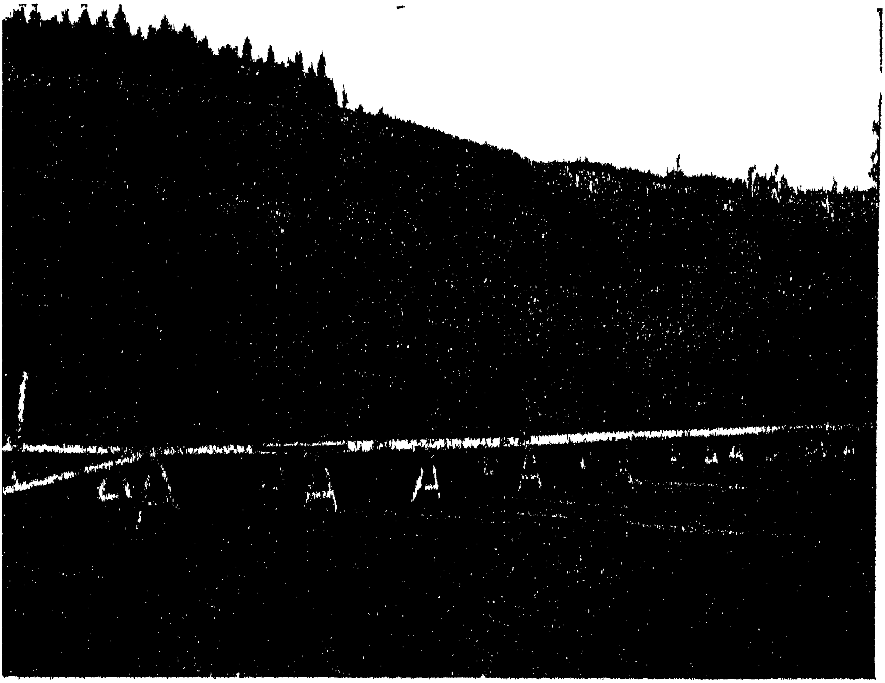


Fig. 4.





the system. Further, he points out that unless due regard is paid to the seasonal variation discussed in this paper, determination of soil water content in an Egyptian cotton field by random sampling is almost worthless.

PERMANENT IMPROVEMENTS DRAINAGE AND IRRIGATION

1324 - **Box Drainage** (1). — BUTZ, A. in *Österreichische Moorzeitschrift*, Year 14, No. 9, pp. 134-142. Staab (Bohemia), September 15, 1913.

This new method of draining consists in the use of long wooden drains having a square cross-section. These drains are built of boards, usually 13 feet long, 2 to 8 inches wide, and about $^{1}/_{2}$ to 1 inch thick, nailed together and forming a continuous conduit.

In the sides of these drains there are slits through which the subsoil water enters. Several of these drains flow into a common drain of larger dimensions as in other sytems of drainage.

Fig. 1 shows a piece of such a wooden drain as well as the arrangement of the board and side slits, the latter from 20 to 40 inches apart. Below, the cross sections of the minors and mains are shown. (5 cm. = 2 in., 7 cm. = 2 $^{3}/_{4}$ in., 10 cm. = 4 in., 12 cm. = 4 $^{3}/_{4}$ in., 15 cm. = 6 in.)

Fig. 2 shows the junction of a minor with a main drain situated at a lower level.

Fig. 3 shows the outflow of a main drain into the main ditch.

For making a wooden box drain, three men are sufficient. Five or six gauge trestles are required; these are trestles bearing on the upper bar some wooden blocks fastened at certain intervals corresponding to the gauge of the drains. Fig. 4 gives the plan and cross section of such a trestle.

The writer describes the making and laying down of such a drain, as well as the advantages it presents over other systems of drainage. Its chief merits are the simplicity and reliablemss of the operation of laying, on account of the great flexibility of the box drains, which are besides admirably suited to soft moor soils with very slight fall.

Fig. 5 shows a drain being laid and fig. 6 the extremity of a drain being finished on a row of trestles.

TILLAGE AND METHODS OF CULTIVATION

1325 - **The Effect of Bastard Trenching on the Soil and on Plant Growth.** — PICKERING, S. U. and RUSSELL, E. J. in *The Journal of Agricultural Science*, Vol V, Part 4, pp. 483-496. Cambridge October 1913.

" Bastard trenching as ordinarily performed consists of two distinct operations; loosening the lower spit of soil, and digging into it farmyard manure or other fertilizing material. A considerable volume of data has been accumulated to show the effect of the addition of farmyard manure to soil, but little is known of the effect of loosening the bottom spit, either on the soil or on the plant.

" The experiments described in this paper were made on plots which had been bastard trenched to a depth of three spits, but not manured. The first and second spits were put back in their natural order. The experiment, therefore, deals simply with deep cultivation effect, and is not complicated by any disturbing factors due to the operation of the manure.

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(1) See No. 229, *B*. March, 1913. (*Ed.*).

" Four distinct types of soil were investigated; a light sand, two loams (both rather heavy) and a strong clay. The bulk of the experiments extended over the four seasons from March 1909 to the end of 1912, a period which included the unusually hot dry summer of 1911, the cold wet summers of 1909 and 1912, and the season 1910 which was of intermediate character.

" Samples of soil were periodically taken for determinations of moisture and nitrate and observations were made on the growth of fruit trees in the plots.

" The results show that trenching has very little effect on the moisture content of the soils. There is some indication that it facilitates percolation from the surface to the subsoil on heavy loams and clay, but the indication is not very marked, and only comes out with certainty on looking over the whole of the results. It also somewhat increases the subsoil moisture. No other tendency could be distinguished, and we must regard trenching as a very minor factor in determining the water supply to the plant.

" Nor did it appear to lead to any marked increases in the store of nitrate in the soil. There were small gains on the sand and rather larger gains on the clay, which persisted over all the four seasons, but these were never very great, and not much above the error of the experiment. Trenching did not appear to alter the distribution of the nitrate between the surface and the subsoil.

" The behaviour of the plant furnishes a sensitive index to the changes in the soil. Here, however, the indications are not much more definite than those given by the determinations of water and nitrate. An increased leaf size (generally of small dimensions) is shown in three out of the four cases in which this feature was measured, but in the fourth there is a reduction; an increased growth was recorded in three cases , but a reduction in two cases; whilst in the two instances where there were records of crops, both are in favour of leaving the ground untrenched. The effect on the growth of trees appeared to depend largely on the character of the seasons following the trenching and planting, as was exemplified by the different results obtained in the same plot of ground after trenching in 1895, and after retrenching in 1910.

" The practical conclusion may be drawn that bastard trenching by itself done without addition of manure to the bottom spit, is not likely to bring about any sufficient change in the soil to justify the trouble and expense of the operation ".

MANURES
AND
MANURING

1326 - **The Production of Guano in Chile.** — YUNGE, G. *Estadistica Minera de Chile en* 1910 *encomendada a la Sociedad Nacional de Mineria por el Supremo Gobierno,* Vol. V, pp. 51-52 and 201. Santiago de Chile, 1913.

The total output of guano in Chile since the beginning of its utilization is shown in the following table.

Output of guano from 1844 *to* 1909.

Years	Quantity	Value
	Tons	£
1844-1902	161 118	378 117
1903.	10 957	20 060
1904	2 625	10 005
1905.	31 790	72 676
1906.	4 634	14 127
1907.	7 399	22 554
1908.	857	6 238
1909.	10 522	31 879
Total.	229 902	555 656
Amount of fiscal surplus price.		398 524
	Total	954 180

The guano output of the small islands along the coast of Chile and of Pisagua, Punta de Lobos, Magellánes Chipana, etc., during the last three years was as follows:

	tons	£
1908	857	6 188
1909	10 523	31 879
1910	12 483	45 232

The above quantities are consumed in the country, the exportation of guano being at present prohibited.

The output of 1910 is principally from Punta de Lobos and Chipana.

The approximate composition of these guanos is:

	Nitrogen	Phosphoric acid (P_2O_5)
	per cent.	per cent.
Punta de Lobos	1.45	25.4
Chipana.	5.80	16.5
Average.	3.62	20.95

Guano is sold for agricultural purposes in bags weighing 100 kg. (gross 102 kg.), or 220 lbs. net., and according to the conditions set by the Government, they are paid the following prices based on the Peso equal to 12 ½ *d*:

Unit of nitrogen (1 kg.)	6 ¼ *d*
» of phosphoric acid $P_2 O_5$	2 ¼ *d*
Dues, etc., per 220 lbs.	3 ⅛ *d*
Percentage of profit	2 ½ per cent.

Calculating the price of the guano on the basis of the average contents and prices given above, it comes to 4.75 pesos per quintal or 3*s* 7 ½ *d* per cwt. (taking the peso at 1*s* 6*d*).

1327 – **Use of Chemical Manures in Cyprus.** — ORR, C. W. (Acting High Commissioner) — *Cyprus Annual Report for* 1912-13, *passim*. London, August 1913.

The Department of Agriculture has taken an active interest in the use of artificials in view of the fact that the soil is especially poor in phosphoric acid. The experiments conducted with various manures succeeded admirably, especially in the case of cereals and pulse, with the result that large quantities of artificials were sold, being used for the first time on a commercial scale.

Demonstrations were also given on the best way of keeping farmyard manure.

1328 – **Sponges as a Fertilizer.** — SMITH, J. G. (Bureau of Soils, Dept. of Agriculture, Washington, D. C.) in *The Journal of Industrial and Engineering Chemistry*, Vol. 5, No. 10. p. 850. Easton, Pa., October 1913.

" Loggerhead " sponge is a large sponge of the gulf of Mexico; it grows abundantly on the coasts of southern Florida, and appears to be used with wonderful results as a fertilizer, especially by the citrus fruit growers. From analyses made at the United States Department of agriculture it appears that the approximate composition of air-dried material is the following: 4 per cent. nitrogen, 0.75 per cent. each of potash (K_2O) and phosphoric acid (P_2O_5), 5 per cent. of lime (CaO and MgO, mainly the former) and 40 per cent. organic matter. It is probable that other non-commercial species of sponges have a similar composition. If so, and from their demonstrated efficiency as a fertilizer, they deserve to be seriously considered as such wherever they are of easy access.

With a view to determining the feasibility of extending their use, further investigations are in progress.

1329 – **Effect of Certain Artificial Manures on the Bushel Weight of Oats.** — *Department of Agriculture and Technical Instruction for Ireland, Journal.* Year XIII, No. 4, pp. 705-707 Dublin, July 1913,

The main effects of the application of artificials are shown in (*a*) the crop yield and (*b*) the quality of the produce. On the former a great deal of experimental work has been carried out, while the latter has not been exhaustively investigated.

No. of Plot	Manure applied per acre	Average bushel weight
	SERIES I, 1909-11 (35 centres).	
1	No manure	36 $^3/_4$
2	1 cwt. sulphate of ammonia	37 $^3/_2$
3	3 » superphosphate	37 $^1/_2$
4	1 » sulphate of ammonia 3 » superphosphate	37 $^1/_2$
5	1 » sulphate of ammonia 3 » superphosphate 3 » kainit	38
6	5 » of same mixture as applied to Plot 5	37 $^1/_2$*
	SERIES II, 1909-12 (48 centres).	
1	No. manure	37
2	1 cwt. sulphate of ammonia 2 » superphosphate 2 » kainit	37 $^1/_2$
3	1 « sulphate of ammonia 3 » superphosphate 2 » kainit	37 $^1/_2$
4	1 » sulphate of ammonia 4 » superphosphate 2 » kainit	37 $^3/_4$
5	1 » sulphate of ammonia 3 » superphosphate 3 » kainit	37 $^3/_4$
6	1 » sulphate of ammonia 3 » superphosphate 3 » kainit	37 $^3/_4$
	SERIES III, 1910-12 (11 centres).	
1	1 cwt. sulphate of ammonia 3 » superphosphate 3 » kainit.	37 $^1/_2$
2	1 » calcium cyanamide 3 » superphosphate 3 » kainit	37
3	1 ½ cwt. nitrate of lime 3 » superphosphate 3 » kainit	37
4	1 ½ » nitrate of soda 3 » superphosphate 3 » kainit	36 $^1/_2$

* Average for 1910 and 1911 only (26 centres).

In the practical manurial experiments with oats conducted by the Department of Agriculture for Ireland, the grain from the various plots was threshed separately, and it was decided to test the bushel weight of a sample of the produce from each plot.

These tests have been carried out each season for the past four years. The bushel weights were determined by means of a chondrometer or corn balance, the average of two weighings being taken for each sample.

The average results are shown in the following tables:

The results of these tests may be summarized as follows:

I. — In no instance is the difference between the bushel weights of the grain from any two of the plots very great.

II. — In all three series of experiments grain of the highest bushel weight has been obtained from the plots manured with the Department's Stantard Mixture, *viz.*

1 cwt. sulphate of ammonia
3 » superphosphate } per acre.
3 » kainit

III. — There was very little difference between the bushel weights of the samples of grain from the plots manured with complete mixtures containing varying quantities of superphosphate and kainit.

IV. — The poorest quality grain was obtained from the umanured plots and that dressed with sulphate of ammonia alone.

V. — Of the four nitrogenous manures, nitrate of soda has produced the lightest grain each season. The results from calcium cyanamide and nitrate of lime were identical.

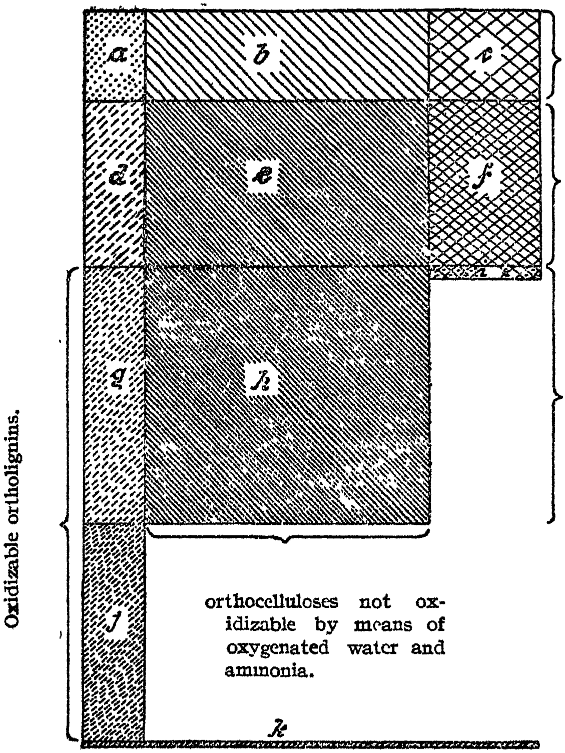
The results of the field manurial experiments with the oat crop had already shown that the above- mentioned mixtures of artificials produce a profitable increase in yield, and these bushel tests prove that these manural dressings distinctly improve the quality of the grain.

AGRICULTURAL
BOTANY.
CHEMISTRY
AND
PHYSIOLOGY OF
PLANTS

1330 - **The Substances classed as Nitrogen-free Extract in Feeding-Stuffs and Human Foods.** — König, J. in *Zeitschrift für Untersuchung der Nahrungs-und Genussmittel*, Vol. 26, Part 6, pp. 273-281 + fig. Münster i W, September 15, 1913.

The bodies collectively known in analyses as nitrogen-free extract form a group hitherto not well defined; as carbohydrates and organic acids they are found in all vegetable food stuffs. This group is usually determined not directly but by difference. It is evident that this method of determination is inaccurate in as much as it bears the errors of the determination of the other five components. The name itself of the group is not very felicitous, for it gives an idea of solubility in water, which exists it is true in a small number of these bodies such as sugar and dextrine, while many of them that are found in pulse, mushrooms, spices, coffee, tea, etc., have more resemblance, as parts of the cell membranes, to crude fibre than to the soluble carbohydrates.

Nevertheless, of late years, much progress has been made in the knowledge concerning these bodies. As has already been stated, very different organic substances belong to this group. A notable number of them (sugar,


a
b
c
d
e
f
g
h
i
j
k
Oxidizable ortholignins.
orthocelluloses not oxidizable by means of oxygenated water and ammonia.

EXPLANATION.

Soluble by means of:

water under pressure, diastase and 1 % pepsin in hydrochloric acid.

2-3 % acids under pressure, or digestion at 135-137° C.

72 % sulphuric acid.

FIG. 1.

a = protolignins.
b = protocelluloses.
c = protopentosans.
d = hemilignins.
e = hemicelluloses.
f = hemipentosans.
g = ortholignins (uncoloured).
h = orthocelluloses.
i = orthopentosans.
j = ortholignins (coloured).
k = cutin, not hydrolizable or oxidizable.

dextrins, starch and inulin, that is the mono-, di-, tri-, and poly-saccharides, and the organic acids : formic, acetic, butyric, valerianic, oxalic, glycolic, malonic, fumaric, lactic, succinic, malic, tartaric, citric, etc.) are well known and of relatively easy and accurate determination. Still more, in some products, such as cereals, flours, tubers and roots (potatoes, beets) and fruit, the nitrogen-free extract bodies are predominatingly starch (inulin), sugars, dextrin and some organic acids, so that the whole group may be justly considered as " carbohydrates ". Another group which is less known, but in some cases sufficiently so for methods of determination to be recognized, consists of pectic, tannic, bitter, colouring and other substances. Lastly, there remain those bodies which form a more or less abundant residue in foods and fodders rich in cell membranes, which up to 20 or 30 years ago were hardly capable of definition. The discovery of pentoses by Kiliani and Tollens, of hemicelluloses by E. Schulze and the researches of several writers on crude fibre, now allow of a fairly clear idea being formed of this not easily soluble group of extracts, which contribute to form cell membranes.

Among these substances four sub-groups are to be distinguished, namely pentosans, hexosans or cellulose, lignin and cutin, of which the first three are found in various degrees of solubility or condensation in foods and fodders.

The distribution of these substances may be represented as shown by fig. 1.

1. — Substances which, like starch, or dextrins and gums, are already soluble in water at a pressure of two or three atmospheres ; they may be designated by the prefix " proto ".

2. — Substances soluble in dilute mineral acids (about 2 to 3 per cent.) at the pressure of 2 to 3 atmospheres, or at the boiling point of the solvent , they may be designated like the hemicelluloses by the prefix " hemi " ; to them belong almost all pentosans and among the hexosans the galactans and mannans.

3. — The hexosans and lignins soluble in cold 72 per cent. sulphuric acid or in 1 per cent hydrochloric acid for 10 hours at 7 atmospheres; and as in this manner the true celluloses can be dissolved, such substances may be designated by the prefix " ortho ".

4. — After the preceding treatment of cell membranes, a brown-black mass of cutin and part of the lignin remains ; on treating with hydrogen peroxide and ammonia the remaining lignin may be oxidized; this may be called " ortho-lignin (coloured) ", to be distinguished from that which was dissolved by the preceding treatment (No. 2) which is " ortho-lignin (colourless)".

5. — Cutin or cutins, including suberins, are not soluble in 72 per cent. sulphuric acid, in cupro-ammoniacal solution, or in hydrochloric acid solution of zinc chloride, nor are they oxidizable by hydrogen peroxide and ammonia and this in consequence of their waxy nature.

These groups of substances are found more or less together in all vegetable matter, penetrating into or superimposed upon each other and in variable proportions. As in the development of plants pentosans and lignins, and apparently cutins also, compared with the hexosans, increase much more than the celluloses, it is to be supposed that the first product of the cell membrane is constituted by hexosans, on which and in which pentosans and lignins go on depositing ; the latter must be formed from the hexosans or from the pentosans by deposition of metoxylic and acetilic groups. As, when the ortho-celluloses are removed from wood, straw, bran, etc., both lignin and cutin preserve the structure of all membranes, the conclusion to be drawn is that these substances are mixed mechanically and not chemically.

In conclusion, the writer, while pointing out that the transitions among the above groups in their several degrees of solubility are not sharply defined, though the degree of solubility keeps constant, expresses the opinion that for the determination of the individual groups an international method will have to be adopted so as to have at least comparable results.

In an appendix some examples are quoted to show how important it is to throw light on the behaviour of the elements forming the cell membranes in the production of food stuffs.

1331 – **The Enzymes of the Tobacco Plant.** — OOSTHUIZEN, J. DU P. and SHEDD, O. M. (Agricultural Experiment Station, Lexington, Ky.) in *The Journal of the American Chemical Society*, Vol. XXXV, No. 9, pp. 1289-1309. Easton, Pa., September 1913.

Many chemical changes take place in the tobacco plant throughout its growth as well as during the curing and fermentation periods. New chemical substances are formed and other are decomposed. The final result of these reactions gives the colour, texture and aroma to the finished product. A change in these transformations is sufficient to destroy the value of the crop. Several authorities have attributed the curing process to bacterial agencies. If this were so, it would be possible to produce any desired brand of tobacco simply by inoculation. Recently, however, Lœw has shown that these changes are not caused by bacteria but are due to soluble ferments or enzymes, which are produced in the plant during its development; he has shown the presence of diastase, oxidases, peroxidases, proteolytic enzymes and cellulose-dissolving enzymes. According to him, the fermentative changes in the tobacco leaf are caused by two oxydising enzymes which take oxygen from the air and effect the decomposition of the various components of the leaves with the formation of new products. These enzymes are in the nature of proteins, and are present in the protoplasm of the cells. Under favourable conditions they are set free in the leaf tissues and effect the above-mentioned changes. They are easily destroyed by excessive heat or too rapid drying.

The writer has studied these enzymes in two typical tobaccos in Kentucky, *viz.*: the White Burley variety and the dark type Yellow Prior. He made experiments with the seeds, green leaves in different stages of development, cured leaves, and with a sample of soil. The seed and leaves showed in every case the presence of appreciable quantities of invertase, diastase, emulsin and reductase, in many cases inulase and a proteolytic enzyme were also found. Soil, on the other hand, contained no enzymes except in two cases. Oxidases appears to be present in the tobacco leaf at all stages of its growth and gradually increase in amount from the seedling stage until the topping stage, after which they gradually decrease until, in the cured leaf they practically dissappear.

During the curing and fermentation periods there is a great loss in weight, as much as 15 per cent., about ¼ of which is solid matter. Certain gases are developed, amongst which ammonia is easily detected. Practically all the starch disappears during the early part of the process and sugar is formed as a new product. This shows the important part played by diastase. The sugars also disappear, being probably destroyed by oxidases. The presence of invertase leads to the conclusion that cane sugar may be stored in the root and afterwards translocated to the leaves. The protein content of the leaves decreases considerably during the ripening of the plant, also during the curing and fermentation period. The presence of amino-compounds during these processes is further proof of proteolytic enzymes. The nitrates also decrease and the nicotine content diminishes. This suggests the presence of reductase and probably there are enzymes acting on the resins and gums. It is believed that the aroma of tobacco is partly due to the decomposition products of gums and resins, as well as to the breaking up of glucosides. Positive tests have been obtained for a glucoside splitting ferment. The presence of fats and proteins results in tobacco of inferior flavour. They are removed by lipeolytic and proteolytic enzymes, provided the conditions are favourable.

The characteristic brown colour which develops during fermentation is attributed to the action of oxidases During the smoking process it has been shown that an ethereal oil is formed from certain products and this probably contributes to the flavour. Citric, malic and oxalic acids are found in greater quantities in the cured leaf than in the green leaf. These are probably transformed to acetic and butyric acids during fermentation. Thus we see that numerous complex chemical changes take place during the growth, curing and fermentation of tobacco and that enzymes play a very important part in these changes. For the product to obtain the greatest commercial value, extreme care and attention is necessary at the critical stage of maturity and also during the curing and fermentation.

CEREAL AND PULSE CROPS

1332 - **Statistical Study of Wheat Cultivation and Trade, 1881-1910.** — UNSTEAD, J. F. (Paper read before the Royal Geographical Society) in *The Geographical Journal*, Vol. XLII, Nos. 2 and 3, pp. 165-181 and 254-276. London, August and September 1913

The above paper presents in a convenient form all the available statistics relating to the quantities of wheat produced, imported or exported, and consumed in the various countries, during the thirty years 1881-1910; the direction of certain movements and developments of which the present conditions are but a passing stage are followed and discussed, the whole period being divided up into three ten-year periods, the statistics for each of which are given separately.

The data have been taken as far as possible from the original returns of the various countries, and the rest from periodical returns compiled by one government from those of other countries and from a few other sources. In collating the various sources of information, the writer sifted and weighed the returns and estimates; he indicates the relative value of the final statistics published in the paper by the use of different kinds of type; ordinary type is used for statistics in which the margin of error is thought to be small, *e. g.* those based entirely or almost entirely upon actual official returns whose accuracy has not been challenged; figures in italic type are used for those where there is an appreciable margin of error due either to the incompleteness or uncertainty of the returns or estimates; figures in italic type enclosed in brackets are employed for mere estimates upon which, when they stand alone, definite conclusions can seldom be based; such estimates of the production of single countries are useful mainly in calculating the production of the whole world, for in that case their errors are small in relation to the total amount, and are likely to cancel one another. The same notation has been adhered to in the accompanying table which summarises the principal figures.

In the *United Kingdom* the area under wheat has decreased 37 per cent. during the whole period, while the yield per acre has increased from 28 to 32 bushels, owing partly to the withdrawal of the poorer wheat lands from cultivation and partly to improved seed and methods of cultivation. The imports have risen to supply the requirements of the population, the consumption per head remaining practically stationary. The relative proportion which imports bear to the total consumption has risen from 67 to 80 per cent. and there is every indication that this rise will be maintained in the future. With regard to the sources of the imports, Table I illustrates the changes that have taken place during the period.

TABLE I. — *Percentage of total imports into the United Kindgom from each of the Chief Sources of Supply.*

Period	Russia	Roumania	Austria-Hungary	India	Canada	United States	Australia	Argentina
1881–1890	15	1	3	12	4	51	4	1
1891–1900	12	1	2	7	7	56	2	8
1901–1910	14	1	0	13	12	32	7	16

It is seen that the supplies from the Southern Hemisphere rose from 5 to 10 and then to 23 per cent. of the total imports. This fact is important in so far as it has a steadying influence on the home markets by counteracting in part the effect of bad harvests in the Northern Hemisphere and by bringing corn to the markets at a different season of the year. Figures are also given to show that the percentge of flour in the imports has decreased from 29 to 19 during the last decade, which is probably correlated with the decrease of the supply from the United States.

France too has reduced her wheat area, but has so raised her yield per acre by improved agricultural methods that her total production is now greater than it was before. The country is almost self supporting, and the consumption per head, though slightly decreased, remains one of the highest in Europe.

In *Germany* the wheat area has been small in comparison with that of France and practically constant throughout the whole period, but the yield per acre has risen in the most remarkable manner from 22 to 29 bushels. The increase in the population and the gradual substitution of wheat for rye in the national diet have been met by a large increase in the imports which is not likely to diminish with time.

In *Austria-Hungary*, the wheat area has increased, and this increase took place almost entirely in Hungary, where three-quarters of the wheat area is situated. Austria now absorbs all the surplus grain produced in Hungary and even that does not quite satisfy the demands of the growing population, whose consumption per head is rising at the same time.

The statistics for the *Russian Empire* in the early period are not very reliable, but undoubtedly the acreage, yield and exports have greatly increased both in Europe and in Asia and are liable to further developments. The total production at present is second only to that of the United States, and if the present rate of increase be maintained will occupy the first place in the next decade; but the proportion available for export is likely to decrease with the growth of the population and the rise of the consumption per head.

Norvay and *Sweden* cultivate very little wheat and make small though growing demands on the worlds markets, while *Spain* and *Portugal* are practically self supporting and show no signs of development. *Italy* shows an increase in all the conditions, as does *Roumania*, which is the only country in the Balkan peninsula which supplies reliable figures.

The uncertainty of some of the *Belgian* figures is due to the fact that previous to 1900 the area was only reported decennially and the production of the successive years was given not as an absolute amount, but as the rate of yield upon the area last reported. The country is becoming more and more dependent on foreign supplies, as are also *Holland*, *Switzerland* and *Denmark*. All these countries, with the exception of Switzerland, where data are lacking, show high yields per acre.

In *India* the figures indicate no great changes in the past nor likely ones in the future, but according to the opinions expressed by several authorities when the paper was read, considerable future development may be expected from her as a wheat-producing country.

Japan has increased her area and especially her yield, but is not able to meet her home demands and now imports a quarter of the quantity consumed, and this in spite of the fact that wheat plays but a minor part as a food-stuff in this country. There is no statistical indication of any marked development of the *Chinese* as wheat-eating people.

In the *United States* the official figures collected and issued by the Department of Agriculture have been corrected and made to agree with those of the Census Bureau. Whilst the area and yield have both increased, the exports have decreased, and unless large additional developments occur in the semi-arid region the country will before long require all its produce to satisfy home demands. During the period under consideration the extension of the wheat area occurred entirely in the West Central States, while the increased yield was manifest in all parts, but especially in the older and more settled portions of the country.

Canada shows a remarkable development as a wheat-producing country, the new wheat areas here, as in the United States, are confined to the west central provinces (Alberta, Saskatchewan and Manitoba), where a further considerable area suitable to the crop is still undeveloped (1), so that the country should eventually attain a production equal to that of the United States. The very high consumption per head indicated during the last decade is probably due to the fact that much of the crop is fed to cattle.

The figures for the *Argentine Republic* point to very rapid development which appears likely to be continued.

Algeria has increased her production by raising her yield and has increased her consumption per head and her exports, practically all of which go to France. *Egypt* has greatly increased her yield, but no longer satisfies home demands, while the *Union of South Africa,* though producing very little at present, in view of the climatic conditions and the possibility of applying dry-farming methods to the Veldt, seems likely to extend considerably its wheat cultivation.

The developments in *Australia* are less important than those in Canada and the yields are extremely low, but both area and yield increased in the last decade and allowed a substantial margin of production for export. *New Zealand,* which at no time had a large wheat area, is apparently still further reducing it in favour of pastoral work The yield per acre is high and the consumption per head is remarkably so, the latter being probably party explained by the fact that the production in New Zealand is liable to violent fluctuations: a world shortage in wheat has been reflected by a great outburst of production in New Zealand; following this, when prices have fallen, the produce has been unsaleable and much of it rotted on the ground.

Taking the world as a whole there was an increase of about 300 million bushels (about 14 per cent.) from the first to the second period, but from the second to the third period there was an increase of nearly 700 million bushels (about 25 per cent.). This great increase was due mainly to an increased acreage, but to some extent (about 8 per cent.) to an increased averrage yield per acre, for while in the first two periods this was 12 bushels, in the third period it rose to 13 bushels per acre.

In each period Europe has produced more than half the total crop, North America has come next, and Asia has been third. The other continents have produced a much smaller amount: South America has increased its importance because of Argentina, and Africa and Australia each produce the same small quantity.

The examination already made of the conditions in the separate countries has led to the conclusion that the acreage may be considerably extended, and a comparison of the yields per acre suggests that in many cases a higher return may be expected. Thus, as the United States already has an average yield of 14 bushels per acre, there seems no reason why with improved methods of cultivation and greater care of the soil, at least as high a return

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(1) See No, 1162, *B* Aug. 1912. (*Ed*).

	Area Sown Million acres			Total Production Million bushels (1)		
	1881-90	1891-1900	1901-10	1881-90	1891-1900	1901-10
United Kingdom	2.7	2.0	1.7	76	60	55
France	17.2	17.1	16.2	301	305	319
German Empire	4.7	4.9	4.6	104	125	133
Austria-Hungary	9.5	10.9	11.9	161	186	213
Russia-in-Europe	30.2	36.2	47.4	244	300	461
Scandinavia	(0.2)	0.2	0.2	4	5	6
Iberian Peninsula	(9.7)	(9.8)	10.0	(107)	(99)	131
Italian Peninsula	(11.3)	11.3	12.2	118	123	163
Balkan Peninsula	(6.0)	(5.8)	(6.0)	(76)	(74)	(77)
Roumania	(3.4)	3.7	4.4	(42)	52	73
Belgium	0.6	0.5	0.4	18	16	13
Holland	0.2	0.2	0.1	6	5	5
Switzerland	(0.1)	(0.1)	(0.1)	3	4	4
Denmark	(0.1)	(0.1)	(0.1)	4	4	4
Europe	(95.9)	(102.8)	115.3	(1264)	1358	1657
Russia-in-Asia	(8.4)	10.6	14.3	(74)	100	155
India	26.7	25.2	26.0	259	243	294
Japan	1.0	1.1	1.2	13	19	20
Persia	(2.2)	(1.9)	(1.6)	(22)	(19)	(16)
Turkey-in-Asia	(4.5)	(4.5)	(3.5)	(45)	(45)	(35)
Asia	(42.8)	(43 3)	46.6	(413)	(426)	520
Dominion of Canada	2.3	3.1	5.9	38	55	110
United States	37.1	43.1	47.4	427	559	657
Mexico	(1.2)	(1.2)	(1.0)	(12)	12	10
North America	40.6	47.4	54.3	477	626	777
Argentina	2.0	5.7	12.0	24	65	130
Chili	(0.9)	(1.0)	1.1	(12)	14	16
Uruguay	(0.4)	0.6	0.7	(4)	6	7
South America	(3.3)	7.3	13.8	(40)	85	153
Algeria	(3.1)	3.2	3.3	(21)	24	33
Tunis	(0.8)	1.0	1.1	(5)	6	7
Egypt	(1.2)	(1.3)	1.3	(12)	(13)	(20)
Union of South Africa	(0.2)	(0.3)	0.5	(2)	(2)	3
Africa	(5.3)	(5.8)	6.2	(40)	45	63
Australia	3.2	4.1	5.7	27	30	56
New Zealand	0.3	0.3	0.2	8	7	7
Australasia	3.5	4.4	5.9	35	37	63
World	192	211	242	2269	2577	3233

(1) 1 bushel = 60 lbs. of grains. — (2) 72 bushels of flour are assumed to be milled from 100 bushels of

Yield. Bushels per acre			Net imports or exports, wheat + flour (2) Million bushels			Consumption per head of population. Bushels		
1881-90	1891-1900	1901-10	1881-90	1891-1900	1901-10	1881-90	1891-1900	1901-10
28	30	32	Im 144	Im. 177	Im. 209	6.0	5.9	6.0
17	18	20	Im. 39	Im. 36	Im. 10	8.2	8.1	7.8
22	25	29	Im. 18	Im. 41	Im. 70	2.3	2.9	3.1
17	17	18	Ex. 11	Ex. 1	Im. 3	3.5	3.9	4.2
8	8	10	Ex. 87 (3)	Ex. 104	Ex. 142	*(1.5)*	*1.7*	2.4
(22)	24	27	Im. 4	Im. 7.2	Im. 11	*1.6*	*1,8*	2.2
(11)	*(10)*	*13*	Im. 9	Im. 10	Im. 12	*(4.5)*	*(4.1)*	*5.3*
(10)	*11*	13	Im. 23	Im. 22	Im 38	4.3	4.1	5.5
(13)	*(13)*	*(13)*	—	—	Ex. *(2)*	—	—	*(4 6)*
(12)	14	17	Ex. 21	Ex. 27	Ex. 42	*(3.4)*	3.5	3,7
30	*33*	*35*	Im. 21	Im. 34	Im. 46	6.4	7.5	8.1
27	28	33	Im. 11	Im. 15	Im. 20	4.0	4.2	4.5
(29)	*(31)*	*(33)*	Im. 12	Im. 15	Im. 17	*5.2*	*5.9*	*5.1*
(27)	*(30)*	*(35)*	0	Im. 2	Im 4	2.0	2.6	3.0
(13)	*(13)*	*(14)*						
(9)	*9*	11	—	—	—	—	—	—
10	*10*	*11*	Ex. 33	Ex. 23	Ex 27	*0.7*	*0.6*	*0.7*
13	17	17	Im. 0	Im. 1	Im. 5	0 3	0.4	*0.5*
(10)	*(10)*	*(10)*	—	—	—	—	—	(1 to *2*)
(10)	*(10)*	*(10)*	—	—	Ex. *(3)* in good years	—	—	*(2)*
(10)	*(10)*	*11*						
16	18	19	Ex. 2	Ex. 13	Ex. 42	*7.2*	7.3	9.4
12	*13*	*14*	Ex. 116	Ex. 178	Ex. 125	*4.5*	*4.6*	*5.6*
(10)	*(10)*	*(10)*	—	—	Im. *(1)*	—	—	*(1)*
12	*14*	15						
12	*11*	11	Ex. 4	Ex. 37	Ex. 84	*6.0*	*5.4*	*6.5*
(13)	*(14)*	*14*	Ex. 4	Ex. 4	Ex. 2	*(2.8)*	3.2	3.7
(10)	*10*	*10*	Ex. 0	Ex. 2	Ex. 1	(5)	*4*	5
(12)	*12*	*11*						
(7)	8	10	—	Ex. 2	Ex 4	—	4.0	4.8
(6)	*6*	6	—	—	Ex. *(1)*	—	—	—
(10)	*(10)*	*(15)*	Im. 0	Im. 1	Im. 6	*(1.3)*	*(1.3)*	*(2.2)*
(8)	*(8)*	*6*	—	—	Im. 8	—	—	*2*
(8)	*(8)*	10						
8	7	10	Ex. 6	Ex. 6	Ex. 28	5.7	5.1	4.9
25	25	31	Ex. 3	Ex. 1	Ex. 1	9.5	8.7	*7.1*
10	8	11						
12	*12*	*13*						

(3) The export and consumption per head figures apply to the whole Russian Empire.

may not be obtained in European Russia, where the average is but 10 bushels. As the present acreage is the same as that of the United States, the yield would also be the same, namely 650 million bushels, or an increase of 190 million bushels.

1333 – **Comparative Experiments on Wheat Selection in Hungary.** — LEIDENFROST, CH. DE BARS in *Köztelek*, Year 23, No. 79, pp. 2691-2692. Budapest, October 11, 1913.

During 1912-13 the writer has conducted comparative experiments with four élite strains of pedigree Hungarian wheat, obtained from M. Székács' selections at Arpádhalom (1). The experimental field, on a loamy soil, was prepared very carefully and put under the following crops: summer turnips, chervil, spinach and corn salad. The soil was then disked and manured with 8 tons 7 cwt. of farmyard manure and 155 lbs. of superphosphate per acre. The seed was sown on the 12th of October; germination was normal, but the young plants got a check in winter, so that a dressing of 66 lbs. of sulphate of ammonia was given. The earliest to ripen was No. 17 (July 15); then followed No. 16 (July 17), while No. 219 was the last (July 21).

The returns at harvest are indicated in Table I.

TABLE I.

No. of strain	Yield of grain per acre	1st class grain	Increase above unselected wheat
	lbs.	%	lbs.
16	2023	59.4	664
17	2004	75,9	645
219..	2524	55.6	1165
226	2598	70.5	1239
Unselected sample	1359	73.5	—

Dr. Kosutány, director of the Royal Hungarian Institute of Chemistry, carried out analyses of which the results are shown in Table II.

Dr. Kosutány remarks that the proportionate increase in the bushel weight of the samples is surprisingly small. This he attributes to the abnormal season, which also accounts for the low protein content. The formation of starch continues much longer during a cold wet season than during a normal dry harvest. Analysis also shows that the samples contain less

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(1) See No. 353, *B*. April 1913. (*Ed.*)

TABLE II.

Chemical and physical analysis of samples of selected wheat.

Strain		No. 226	No. 16	No. 219	No. 17
Weight per bushel	lbs.	61.4	62 3	63.3	62.4
Weight of 1000 grains	gms.	46.5	39.2	40.3	42.0
Volume of 1000 grains	cc.	37.4	28.7	30.0	31 1
Moisture	%	14,94	14.60	14.78	14.97
Ash	»	1.47	1.71	1.42	1.73
Protein (N × 6.25)	»	12.06	10.93	11.06	10 81
Nitrogen	»	1.93	1.75	1.77	1.73
Fat	»	1.87	1.74	1.89	1.93
Crude fibre	»	3.83	3.79	3.24	3.69
Gluten, moist	«	38.95	31.90	42.45	34.30
Gluten, dry	»	11.69	9.80	12.70	10.68
Quality of gluten	»	weak, lacking in cohesion.			

gluten and more moisture (15 per cent.) than is usual in Hungarian wheats (rarely up to 12 per cent.).

These experiments show the value of seed selection in improving the yield of wheat even in unfavourable seasons.

1334 – **Seeds and Flour of *Dolichos multiflorus*.** — *Renseignements de l'Office Colonial*, No. 9, pp. 510-512. Brussels, September 1913.

The velvet bean (*Dolichos multiflorus*, = *Mucuna pruriens*) is cultivated at Eala (Belgian Congo) as green manure. The following analyses show the nutritive value of its seeds.

	Seeds	Flour
Moisture	13.23	18.30
Mineral matter	2.95	0.18
Fats	5.12	0.09
Crude fibre	4.04	0.43
Pentosans	4.71	traces
Total nitrogenous matter	23.70	0.42
Nitrogen-free extract	41.20	80.58
Undetermined	5.05	(by difference)
	100.00	100.00

The seeds have a food value equal to that of peas and lentils and better than that of *D. Lablab* (hyacinth bean).

	Total food values
D. multiflorus	219
D. Lablab	185
Lentils	218

The starch of *D. multiflorus*, produced by primitive methods, is equal to that of potatoes. If manufactured on a commercial basis the waste could be considerably reduced.

FORAGE CROPS. MEADOWS AND PASTURES

1335 - **Sorghum Growing in the Victorian Mallee for Summer and Autumn Sheep' Feed.** — *The Pastoral Review*, Vol. 23, Part 7, p. 673. Melbourne, July 15, 1913

This is a communication of the results of an investigation on the profitableness of growing *Sorghum saccharatum* as summer and autumn feed for sheep in the State of Victoria. Two paddocks, together 270 acres in extent, were sown to sorghum during September and October of last year, and fed off with sheep during six months beginning on November 22, after which they were sown to wheat. The flock consisted of an average of 563 head of ewes. In addition to these two sorghum paddocks, two adjoining grass paddocks very bare of pasture, of about 100 acres each, were available for the sheep while the sorghum paddocks were being "rested" during the test. When the sheep were turned out to graze they were in low condition; at the end of the test they were quite fat.

The results figure out as follows:

	£	*s*	*d*
Profit on 563 sheep grazed as above at 5*s* per head	140	15	0
Deduct cost of sorghum seed, manure and drilling (£40 10*s*) and grazing value of bare grass land (at most £30)	70	10	0
Leaving net profit on 270 acres of sorghum	£ 70	5	0
say 5*s* 3*d* per acre.			

The result may be considered satisfactory, all the more so as the flock might have been by a couple of hundred head more numerous, besides which an average of 10 head horses and cattle were frequently grazing with the sheep.

FIBRE CROPS

1336 - **Report on Irrigation Experiments with Cotton at Richard-Toll (Senegal) (1912-13).** — LEBERT, A. in *Bulletin de l'Association Cotonnière Coloniale*, Year 11, No. 58, pp. 469-486. Paris, September 1913.

The area devoted to cotton experiments was limited by the number of available pumps and extended over 35 acres. The soil when dry was as hard as cement and contained crevices up to 20 inches deep and 1 ½ inches wide. In such a soil it is necessary to sow from 15 to 20 seeds in each hole. When irrigated, the soil looses its consistency, and the plants, loated with capsules, become top- heavy and require earthing up after each irrigation. Towards the end of March irrigation had to cease as the water became salt. Nevertheless the yield was distinctly better than in previous years; 900 lbs. per acre were obtained, representing 300 lbs. of fibre. Had it not been for the brackish water, the writer estimates that the yield would have been, a third greater. All the crop was of the same quality, a fact of considerable importance in determining its commercial value.

Cost of production.

		Cost per acre		
		£	s	d
Ploughing			13	0
Harrowing			1	10
Manuring		1	11	0
Clearing			1	4
Sowing			7	0
Singling, hoeing, topping			15	1
Irrigation	Hand labour		18	10
	Petrol and oil		19	3
	Canals		2	9
Earthing-up			15	0
Harvesting		1	1	2
Maintenance of animals			17	10
	Total	£8	4	1

The cost of production will be reduced as follows:

1) More efficient methods of cultivation.

2) Improvements in the methods of transport and of applying the manures.

3) Reduction in the cost of hand-labour at harvest by increasing the supply.

1337 - **The Kapok Tree in Togo.** — ULBRICH, E. in *Notizblatt des Königl. botanischen Gartems und Museums zu Dahlem bei Steglitz (Berlin) sowie der botanischen Zentralstelle für die deutschen Kolonien,* Vol. VI, No. 52, pp. 39-65 + plates. Leipzig and Berlin, September 8, 1913.

This bulletin gives the results of an inquiry held in Togo at the instigation of the *Botanische Zentralstelle für die Kolonien,* on the production of kapok.

The writer draws a clear distinction between the two varieties of *Ceiba pentandra* (L.) Gärtn.

1. Spiny: Bushy habit of growth; branches in horizontal layers; very pronounced buttresses at base of trunk; leaves dark green, strongly acuminate; fruits dehiscent on the tree; colour of fibres varying from grey to white; seeds round.

2. Spineless: Trees tall and slender; branches almost erect, at 30° to the vertical; buttresses scarcely visible; leaves light green, slightly acuminate; fruits larger, falling before dehiscence; fibre white; seeds slightly pyriform.

According to the writer, the spineless variety is a cultivated form of the other only met with in the neighbourhood of dwellings and requiring propagation by cuttings to keep true to type. It is also the most suitable for cultivation owing to the absence of spines and obstructive buttresses. and to having larger fruits containing a whiter fibre. As the fruits do not open before falling the kapok is not carried away by the wind or soiled by contact with the ground. This variety, however, requires more sun.

Finally the writer gives a list of points which require to be worked out with regard to the forms of *C. pentandra.*

SUGAR CROPS

1338 – The Position of the Cane Sugar Industry during the Last Twenty Years. — PRINSEN GEERLIGS, H. C. in *The International Sugar Journal*, Vol. XV, No. 178, pp. 466-473. London, October 1913.

The abolition of slavery (1834-1886) together with the sugar bounties, begun in 1883 to give a stimulus to the sugar beet industry, placed the cane industry in a very bad position until the Brussels convention changed the state of affairs in 1903. Being thus placed on an equal footing, the sugar cane industry increased its capital and was able to improve its machinery and methods of cultivation. Since the middle of the 18th century, the industry had made little progress, but after 1880 certain colonies, notably Java and Hawaii, began to apply certain improvements which had been effected in the beet industry.

The cane industry received a great stimulus from the Spanish-American War, which resulted in the occupation of Porto-Rico and the Philippines by the United States and the pouring of American capital into Cuba. This, together with the preferential tariff accorded by the United States to these and the Hawaian Islands, caused a great development of their cane industry. The occupation of Formosa by Japan had a similar effect, as did the establishment of protection in South Africa and Australia. The accompanying table illustrates the changes that have taken place.

Previous to the Brussels convention the quantity of protected sugar cane was hardly one-quarter of the total production and since then it has considerably increased, but with the application of the new American tariff it will amount to only about 12 per cent. of the total production.

Sugar cane is largely consumed where it is produced or in its immediate neighbourhood. The British East Indies consume all the local product and also the greater part of the production of Mauritius and one-third of the production of Java. The United States consume the production of Cuba, Porto Rico, and several of the other West Indies besides that of Hawaii. China and Japan consume the produce of Formosa and a portion of that of Java and the Philippines. The sugar produced in China, Cochinchina, Mexico, the South American Republics, Natal, Australia and Egypt is almost entirely consumed locally. Several of these countries also consume a small proportion of foreign sugar. Formerly Great Britain, the United States and Canada all imported large quantities of sugar from different parts of the globe. Now England alone varies the place of origin of her supplies according to the abundance or otherwise of the harvest in the various producing countries.

World's Production of Sugar Cane in thousand tons.

	1900		1912	
	Protected	Unprotected	Protected	Unprotected
British India	—	1 799	—	2 552
Straights Settlements	—	20	—	6
Cochin China	—	50	—	50
China	—	150	—	60
Japan	40	—	40	—
Formosa	—	45	117	—
Philippinees	—	63	175	—
Java	—	744	—	1 331
Spain	35	—	20	—
United States	273	—	168	—
Mexico	—	75	130	—
Cuba	—	283	2 375	—
Porto Rico	—	52	340	—
Other Antilles	—	241	—	268
Central America	25	—	22	—
Colombia	10	—	10	—
Venezuela	5	—	5	—
Demerara	—	85	—	90
Surinam	—	13	—	13
Ecuador	6	—	7	—
Peru	118	—	140	—
Brazil	185	—	204	—
Argentine	117	—	150	—
Egypt	—	99	—	58
Mozambique	—	—	30	—
Natal	16	—	97	—
Mauritius	—	157	—	207
Reunion	—	43	—	40
Australia	113	—	130	—
Hawaii	268	—	480	—
Fiji	—	33	—	60
Total	1 211	3 962	4 640	4 735

1339 - **Wood-oil Trees of China and Japan.** - WILSON, E. H. in *Bulletin of the Imperial Institute*, Vol. XI, No. 3, pp. 441-461. London, July-September, 1913.

The increasing demands of Europe and North America for wood-oils from China and Japan has resulted in considerable increases in the price and production. The cultivation of these oil-producing trees *Aleurites* sp.) is recommended to Agricultural Departments for experiment in the warm-temperate rocky regions of the colonies. Their culture requirements are of the simplest, growth is rapid and the trees commence to bear fruit in four or five years after the seed is sown. They fruit freely and are apparently indifferent to the nature of the soil.

Chinese species. — 1. *Aleurites montana* Wils. (or Mu-yu-shu).

This species originated in the South-East of China and is still cultivated there. It requires a subtropical climate and abundant rainfall. The male inflorescence is a many-flowered much branched corymb and the female inflorescence a few flowered raceme borne on the same tree. The fruit is egg-shaped-5 to 6 cm. long, 4 t 4.5 cm. wide, pointed at the summit and flattened at the base, with three longitudinal and many transverse much raised ridges ; the interior part of the fruit (mesocarp) is thick and woody and encloses three compressed broadly obovoid seeds about 3 cm. long by 2.5 cm. broad and warty on the outside. The yield of oil from this tree is small.

2. *Aleurites Fordii* (or Tung-yu-shu).

This is the most important species, producing nine-tenths of the wood-oil of China. It is recommended for experiment in various parts of the British Empire. The seeds soon lose their power of germination, but dried in the sun for 2 or 3 days and packed in barrels or sacks they retain their germinating power for 3 or 4 months. It occurs in all the warm temperate parts of China, but more, specially within the watershed of the Yangtze river. It is essentially a hill-side tree thriving in the most rocky situations and in the poorest of soils where there is a minimum rainfall of 70 cm. (27 in). It will also withstand drought and a few degrees of frost. The flowers appear in April before the leaves unfold and are borne in numerous terminal and axillary few-flowered, cymose corymbs. The central terminal flower of each cyme is female, the others usually male.

The fruit is apple-like, green to dull brown when ripe, 4 to 5 cm. long and broad, pointed at the summit, narrowed to the foot-stalk and perfectly smooth on the outside. It contains 3 to 5, rarely more, broadly obovoid seeds. Both fruit and seeds are poisonous, causing severe vomiting and purging. The fruit ripens in September and October and is gathered before dehiscence, placed in heaps and covered with grass and straw to effect fermentation. The skin soon decays and the seeds are easily removed. In China this tree is only planted where other cultivation is impossible. For cultivation on a commercial scale the writer recommends planting not less than 20 ft. apart each way.

The process of extraction adopted in China consists in first crushing the seeds in a circular trough beneath a heavy stone wheel. The mass is then roasted in a shallow pan, placed in a wooden vat with a wicker bottom and thoroughly steamed over a cauldron of boiling water. With the aid of an iron ring and straw it is made into circular cakes which are arranged edgeways in a large wooden press and the oil is squeezed out of them. The yield is about 40 per cent by weight of the kernel. Chemical analyses of the kernels gave 58.3 per cent of oil. The local uses of these oils are numerous. They are the chief paint oils of the country and are largely employed as varnish, as water-proofing material, as ingredients in concrete and in medicine.

Physical Properties of Tung-Oil.

	Chapman	Imperial Institute
Specific gravity	0.942	0.940
Saponification value	194.2	191.8
Iodine value %	170.6	166.7
Refractive index at 20° C	1.5179	—
Viscosity by the Redwood Viscosimeter at 15.5° C in seconds	1850	—

Thus tung-oil is characterised by 1) a specific gravity higher than that of almost any vegetable oil, except castor and tallow-seed oils, 2) a refractive index higher than any known vegetable oil and 3) a high viscosity. Its most characteristic property is the formation of a firm gelatinous mass when heated to a temperature of 250° C. for a short time; this change appears to be due to polymerization and not to the absorption of oxygen. The property of forming a gelatinous mass on heating is the basis of a number of tests. Genuine tung-oil should yield a firm jelly which crumbles readily in the fingers and is not sticky.

Its principal uses in Europe and America are in the preparation of paint 'driers', which are compounds of the fatty acid of the oil with metals like lead and manganese, and are known as " tungate driers ". Processes have also been invented for its use in the manufacture of linoleum, rubber substitutes, waterproof paper, etc., but it is not possible to state to what extent the oil is used for such purposes at the present time.

Japanese species. — Aleurites cordata R. Br.

This species is distinguished by its fruit, which is 2.5 cm. long, wider than long, flattened and often depressed at the summit, slightly tapering to the pedicel, with three slight longitudinal and several irregularly transverse ridges. The oil of this tree has been confused with that of the Chinese species. The specific gravity, iodine value and refractive index are lower than in the Chinese variety, and the Japanese oil will remain liquid under conditions such as suffice to convert the Chinese oil into a hard jelly.

The article is illustrated by five plates and a reference index is appended.

RUBBER, GUM AND RESIN PLANTS

1340 - The Cultivation of Rubber Trees in West Africa (1). ***Funtumia elastica.*** — CHEVALIER, A. in *Journal d'agriculture tropicale*, Year 13, Nos. 143 and 145, pp. 136-139 and 197-201 Paris, May and July, 1913:

Funtumia elastica is the only tree indigenous to Africa which yields a good quality of rubber. Although it has been cultivated for nearly 30 years, we still know very little of its biological peculiarities. The writer summarizes the observations he has made amongst the natives. These are of great importance, and the conclusions to be drawn from them will serve as a basis for the constitution of new plantations.

Trees which are allowed to develop surrounded by dense undergrowth have long clean stems and appear more suitable for latex production. On the other hand trees planted in clearings and well-kept plantations develop a thick stunted growth and a short, much-branched trunk. They mature earlier but yield less latex.

The writer reviews the results obtained in the principal colonies where *Funtumia* is cultivated, *viz.* the Gold Coast, S. Nigeria, the Belgian and French Congo. He then gives some interesting details of the plantation at Bokoné (Gaboon). In 1906 some trees were planted 12ft by 12 ft., and others 10 ft. by 7 ft. In both cases the development of the trees was normal. At the end of 6 years they reached a height of from 30 ft. to 35 ft. with clean trunks from 15ft. to 20 ft in length. The author attributes this fine growth to close planting, as the soil was of quite average fertility.

In one portion of the plantation the branches were destroyed by a fungus disease. With a view to promoting a rapid and straight growth in the new shoots it seemed desirable to allow the natural growth to spring up round the trees, especially that of Musangas, which shoots up very rapidly. The half etiolated shoots of Funtumia grew up with the Musangas, and the latter were not cut down until the new shoot had reached a suitable development.

1341 - The Cultivation of *Manihot Glaziovii* in the Belgian Congo. — JACQUES, A. in *Bulletin de l'Association des planteurs de Caoutchouc*, Vol. V, No. 9, pp. 223-224. Antwerp, September 1913.

Until recently the culture of Manihot has been neglected in the Belgian Congo. In 1911 only two or three small plantations existed, possessing between them some thousands of trees. The writer gives figures showing results obtained in this region with *Manihot Glaziovii.* A tree six years old planted in good soil yields an average of 2 lbs. of dry rubber per annum. The yield increases rapidly with the age of the trees until it reaches 5 or 6 lbs at the age of 8 or 9 years. With hand labour it is possible to establish and maintain a plantation of 1000 ha. (2470 acres), containing 1 200 000 trees, until the trees come into bearing with a capital of 2 million francs (£80 000).

The present price of Manihot rubber on the Antwerp market is under 9*d* per lb. In the event of a further decrease in the price of rubber, plantations of 3 and 4 years growth could be left without cultivation for several years until the price recovered.

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(1) See No. 637, *B.* June 1913. (*Ed.*).

VARIOUS CROPS

1342 - **The Influence of Rainfall on the Quality of Tobacco in Sumatra.** — SCHAEFFER, G. in *L'Agronomie Coloniale*, Year 1, N. 3, pp. 65-67. Paris, 30. September 1913

The best quality of tobacco leaves are produced when the plant grows very rapidly; consequently an abundant and readily available water supply at the right moment is an important factor in the production of high-class tobacco. Dry weather in the early stages of plant growth would cause a considerable development of the root system in search of moisture; should this be followed by rains (about a month after planting out) optimum conditions should then obtain for rapid growth. Such favourable conditions prevailed during 1911 at Deli, Sumatra, whilst in 1909 the weather conditions were quite the reverse. The quantity of tobacco harvested at Deli in 1911 was slightly greater than that harvested during 1909, but its quality was considerably better, as shown in the following table:

Years	Rainfall in inches		Price per lb.
	March	April	
1909	5.3	1.8	1s 3*d*
1911	0.2	9.1	2s 2*d*

1343 - **Tea in Russia.** — JUMELLE, H. in *Journal d'Agriculture tropicale*, Year 13, No. 147, pp. 260-262. Paris, September 1913.

Russia consumes over 140 million pounds of tea per annum. Two thirds of the tea imported from China are in the form of compressed blocks, either briquettes or tablets.

Tablets.. — The waste powder in the process of manufacture is sifted, and the fragments of leaves are made into tablets, which are subjected to great pressure for some time, then wrapped in tin-foil and white paper. These constitute the best quality of compressed tea.

Briquettes. — These are made from the siftings, consisting of stems and leaf stalks. These are pressed into blocks and subjected to a current of steam for 3 minutes. To compensate for the loss of aroma during this process, 5 to 50 per cent. of foreign tea is mixed in. These briquettes are made of both black and green tea. In the latter case, a longer exposure to vapour is necessary. They are wrapped up in white paper only.

The tablets weigh approximately ¼ lb., and are packed in wooden lead-lined boxes. The briquettes of black tea contain from ½ lb to 3 lbs., whilst those of green tea are made up in two qualities, the best quality weighing 1 ½ lbs. and the second 3 ¼ lbs. They are packed in bamboo baskets lined with leaves.

Attempts at tea cultivation have been made in Russia since 1848. It is grown in the Caucasus, especially on the south-east side of the Black Sea, where the climate is warm and moist and the soil a fertile red clay. The annual production is about 130 000 lbs. The first picking takes place after four years, and is repeated 3 or 4 times each year. The product does not possess the aroma of well-grown tea, and is used chiefly by the poorer classes, who buy it in the form of briquettes.

1344 - **The Cultivation of Buchu.** — VON WIELLIGH, G. R. in *The Agricultural Journal of the Union of South Africa*, Vol. VI, No. 1, pp. 80-87. Pretoria, July 1913.

The cultivation of buchu has been much neglected in South Africa, and, owing to the wasteful method of rooting up the plants to collect the leaves, it is almost in danger of extermination.

The exports have diminished from 243 742 lbs in 1908 to 223 021 in 1912 and the price of the exported leaf has risen about 500 per cent. The writer carried out experiments with different varieties and obtained the following results:

Varieties. - 1) *Barosma serratifolia* (Kloof Buchu), sometimes known as "fountain buchu" on account of its preference for a damp soil. It grows to a height of 4 feet but may even reach a height of 10 feet, and is found at altitudes varying from 500 to 1000 feet above sea-level.

2) *Barosma betulina* (Mountain Buchu) is the most valuable species as it contains the greatest number of oil glands in its small, light green leaves. It is more compact and dwarf than the above and grows to a height of 3 or 4 feet. It is found at altitudes between 1000 and 2000 feet and is the most abundant species of buchu.

3. *Barosma crenulata* (Large-leaved Buchu), is little known and is not widely distributed.

The soil most suited to this plant is a well-drained sandy loam. It is propagated either by seeds or cuttings. Transplanting takes place during the autumn (March to May) in well cultivated soil, after a heavy rain and the plants are placed 5 ft. apart each way.

Cultivation. — This consists of weeding and raking the surface soil between the plants; this must be done very lightly, so as not to damage the roots which run horizontally.

Harvest — The leaves are richest in oil in January and February but if it is desired to save the seed the crop must be cut later.

Uses. — The leaves are used as a diuretic and stomachic. Badly prepared leaves lose a considerable quantity of their properties, and it is preferable to extract the oil in alcohol or boiling water and market the product in this form. It is often adulterated with *Empleurum serratulum*, which is absolutely worthless.

1345 - **The Importance of the Cultivation and Preparation of Medicinal Plants, particulary in Hungary.** — IRK, KÁROLY (Chemist at the Experimental Station for Medicinal Plants at Kolozsvár) in *Köztelek*, Year 23, No. 74, pp. 2553-2555. Budapest, September 24, 1913.

Of late years, pharmaceutical literature has been paying increasing attention to the question of culture and preparation of medicinal plants.

TABLE I.
Hungarian Trade in Dried Medicinal Plants, 1911.

Country	Imports to Hungary — cwt.	Exports from Hungary cwt.	 £ s
Austria	5 197	17 956	28 512–10
Bosnia-Herzegovina	417	26	40–12
Trieste	18	—	—
Germany	951	18 379	38 379– 5
Switzerland	—	218	434–15
Italy	126	2 474	3 352– 0
France	43	690	1 370–17
Belgium	4	30	56– 5
Netherlands	53	190	360– 0
Great Britain	57	1 290	2 046–18
Denmark	—	14	30– 8
Russia	146	199	378–15
Roumania	—	77	195– 0
Servia	2	53	105–15
Turkey-in-Europe	4	53	135– 0
India	6	—	—
Hong-Kong	2	—	—
China	8	—	—
Egypt	—	22	55– 0
Tunis	6	—	—
United States	45	4 302	10 930– 0

Apart from old data published spasmodically and now out of date, TSCHIRCHET may be considered the initiator of the rational cultivation of medicinal plants in Europe. His work (1) and that of THOMAS (2) are looked upon in

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(1) Ueber den Anbau der Arzneigewächse in Deutschland. - *Archiv. der Pharm.*, 1890, 228, 663, Arzneipflanzen. - *Real-Enzyklopädie der Pharm.*, 2. Aufl., etc.

(2) *Arbeiten des pharmazeutischen Institutes der Universität Berlin.*

TABLE II.

		Plants and dried parts of plants used in medicine	Other plants and dried parts of plants; Saponaria roots	Aniseed and coriander	Caraway seed	Pyrethrum powder	Juniper berries
		cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Imports	1911 . .	7 085	7 122	431	8 366	1 470	31 252
	1912 . .	6 451	5 609	—	—	—	—
Exports	1911 . .	46 098	1 254	1 450	457	277	4 757
	1912 . .	39 874	862	—	—	—	—

Germany as the basis of the study on the subject. Next to Germany, Hungary, under the direction of Dr. PATER (1), Director of the Agricultural Academy of Kolozsvár, takes the second place in relation to the study of this subject. Next come MITLACHER in Austria (Korneuburg), SENFT (2) in Bohemia and Dr. VRGOC in Croatia, following Hungary's example.

In Germany, the University of Berlin has set apart an experimental field for this work at Steglitz-Dahlem. In France the Ministry of Agriculture pays particular attention to the cultivation of medicinal plants and publishes the results of experiments, which are carried out on a modern scientific basis. In Sweden, the experimental garden at Landskroma receives state assistance. In America the matter is under the control of the Bureau of Plant Industry with a special section of the Department of Agriculture at Washington to deal with Drug Plantations. The University of Minnesota has an experimental field of considerable area under the control of the Pharmaceutical Institute. Following the example of the Experimental Station for Medicinal Plants in Hungary, stations at Korneuburg and Prague in Austria have already been started. All these Stations, furnished with chemical, therapeutic and pharmacological laboratories, are intended for research with a view to determining on the one hand a rational cultivation of medicinal plants, and on the other the working-out of special chemical experiments.

The author outlines the conditions of the cultivation and preparation of medicinal plants in Hungary and furnishes statistics on the commercial movement in dry medicinal plants in 1911 (see Table I, p. 1873).

As may be seen from the statistics given, medicinal plants exported from Hungary find markets chiefly in Germany, France and America, countries whose great pharmaceutical factories demand considerable importation.

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(1) *Kiserletügyi Körzlemények.*

(2) *Mitteilungen des Komitees zur staatlichen Förderung der Kultur von Arzneipflanzen in Oesterreich.*

Completing these figures by the commercial value of plants and parts of plants not enumerated above, we obtain the gross amount of Hungary's exports and imports, as shown in Table II.

The exportation of medicinal plants from Hungary is increasing and the quality of the products is also improving. The cultivation of these plants in Hungary on a sound basis and their preparation on a larger scale, when the confidence of other countries has been gained, will consolidate this industry and the industrial branches connected with it.

MARKET GARDENING

1346 – **The Present State of Japanese Horticulture.** — *Communicated by* HIROSHI HARA, *Professor of Horticulture in the Faculty of Agriculture, Imperial University of Tokyo, Japan.*

The development of horticulture in Japan dates from the introduction of Western civilisation. Since 1875 more especially, fruit trees, vegetables, flowers and ornamental trees have been imported from Europe and America. Similar importations have been received from China. These species and their varieties have been improved and their cultivation extended.

Houses in European or in Euro-Japanese style have increased in number, while in the arrangement of trees, etc., in the new gardens it has been found necessary to depart from the traditional arrangement of the Japanese country garden.

For the development of horticulture the Government has established a Horticultural Section of the Agricultural Station, which is under the control of the Minister of Agriculture and Commerce, and every provincial agricultural station includes a study of this subject. Besides this, the two Imperial Universities, controlled by the Minister of Public Instruction, possess Faculties of Agriculture which include courses in horticulture.

The area devoted to the culture of fruit trees has extended considerably in the last ten years, and the yield of horticultural products has increased remarkably to meet the growing demand. The amount of produce exported to foreign countries is not yet very great. Its total value rose in 1910 to the sum of 4 673 699 yen (one yen = 2 *s* approx.). The principal exports are tangerines and oranges (746 184 yen), apples (439 518 yen), onions (471 609 yen), potatoes (417 545 yen), lily bulbs (737 888 yen), other plants and bulbs (248 306 yen), preserved fruits and vegetables (310 328 yen).

The fruit trees and culinary plants most generally cultivated are:

Fruit trees: pear, apple, peach, plum, cherry, Japanese apricot (*Prunus Mume*), persimmon (*Diospyros Kaki*), fig, chestnut, vine, tangerine, orange.

Vegetables: Radish, turnip, carrot, burdock (*Lappa edulis*), sweet potato, potatoes, welsh onion (*Allium fistulosum*), onion, cabbage (*Brassica* sp., *B. chinensis*, etc.), *Cryptoenia canadensis* var. *japonica*, *Aralia cordata*, egg-plant, cucumber, gourd, water-melon, peas, beans, strawberry, etc.

Fruit is generally consumed in a fresh state; cooked fruit is not much appreciated. Certain fruits, such as the persimmon, are eaten either fresh or dried. The small demand for preserved fruits is probably due to the fact that they do not go well with a rice diet.

The trees are cultivated on the following systems:

1) *As bushes:* Apple, pear, plum, cherry, Japanese apricot, persimmon, fig, chestnut, tangerine, orange, etc.
2) *In pots:* Peach, plum, Japanese apricot, persimmon, etc.
3) *Umbrella-shaped:* Vine, pear, etc.
4) *As espaliers:* Vine, etc.

Violent winds are frequent in Japan all through the summer and cause damage to fruit trees. The umbrella-shaped system is the best for resisting these winds, though inconvenient for treating insect and fungoid diseases. It is, however, on the whole the most suitable for the climate and is generally adopted for certain fruit trees, being most conducive to fruitfulness. For many years fruits have been cultivated under glass, especially vines, peaches, melons, etc. The forced culture of vegetables increases from year to year, as also the cultivation of flowers under glass.

Great attention is now being paid to the preparation of dry vegetables and to the preservation and packing of fruit.

The climate of Korea is much drier and sunnier than that of Japan: fruit trees flourish better and produce a better quality of apples, plums, cherries, grapes, etc. The cultivated surface and the produce are increasing annually.

FRUIT-GROWING.

1347 - **European Fruit Trees in Central Madagascar.** — FAUCHÈRE, A. in *Journal d'Agriculture tropicale*, Year 13, No. 147, pp. 257-260. Paris, September 30, 1913.

The central region of Madagascar has a very agreeable climate and when cleared of marshes will be quite suitable for settlement. Consequently attempts have been made to acclimatise European fruit. Unfortunately this process becomes complicated by the fact that the trees commence to ripen their fruit towards the end of the winter season during warm damp weather.

The trees vary somewhat in their degree of adaptation. Peaches and apricots fruit abundantly, but plums have not yet given satisfactory results. The apple is almost as successful as the peach, but the pear and cherry are difficult to acclimatise. Figs are very uncertain in their results, whilst the raspberry is extensively cultivated. Good varieties of oranges and tangerines are yet very rare. Vines flourish in this climate and one variety, the Malagasy vine ("vigne malgache") is almost immune to attacks of mildew and meets with considerable favour. The quince is well adapted to the climate and the chestnut grows vigorously, but its fruits are destroyed by insects. The persimmon produces large fruits in great abundance.

The station at Nanisana is largely responsible for the introduction of fruit trees, and possesses extensive nurseries where large quantities of grafted specimens are produced each year.

Fruit culture is no longer only of local interest, as the gardeners of the centre have begun to send supplies to all the markets in the island.

1348 - **The Composition of Irrigated and Non-irrigated Apples.** — JONES, J. S. and COLVER, C. W., in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 424-428. Cambridge, October 1913.

The writers give the results of analyses of 116 varieties of apples grown with irrigation and of 168 varieties grown without irrigation; the percentage of water, total solids, sugars, acids and crude protein was estimated. The differences between the apples from irrigated and non-irrigated trees are small and variable, and where the desiccated apple is the article of commerce, the writers consider that there can be no basis for market discrimination between the fruit from irrigated and non-irrigated trees.

FORESTRY

1349 - **Three Forest Species of the Annamitic Range.** — DUBARD, M. and EBERHARDT, PH. in *L'Agronomie coloniale*, Year 1, Nos. 2 and 3, pp. 38-41 and 76-81, plates 3. Paris, August and September, 1913.

The writers describe three forest species well distributed throughout this range and of considerable economic importance, but not previously recorded.

I. *Wrightia annamensis* Eber. et Dub. This is a small tree very common in Annam and Tonking, scarcely exceeding 7 to 8 metres in height, with a trunk of maximum diameter of 15 cm. (6 in.) It is found in deep valleys in cool shady situations. It produces a very resistant wood used in making wooden clogs. In structure it resembles boxwood. Considering the ease with which it can be cut and worked, it should be suitable for wood carving.

II. *Symplocos multiflora* Eber. et Dub. This tree has cylindrical branches covered with a reddish bark. The inflorescences are arranged terminally in simple clusters of 40 to 60 cm. in length with separate flowers. The wood is used in Annam as building material.

III. *Symplocos Dung* Eber. et Dub. This tree also has cylindrical branches, at first greenish yellow in colour, later developing a light brown covering of bark. The inflorescences are axillary, consisting of simple few-flowered spikes 6 cm. in length. The wood is used for making plough-shares and harrows.

LIVE STOCK AND BREEDING.

HYGIENE

1350 - **A New Species of *Crotalaria* Dangerous to Cattle in German East Africa** — BAKER, E. G. in *Notizblatt des Königl. botanischen Gartens und Museums zu Dahlem bei Steglitz (Berlin), sowie der botanischer Zentralstelle für die deutschen Kolonien*, Vol. VI, No. 52, p. 66. Berlin, September 8, 1913.

The writer describes a poisonous species of *Crotalaria* as *C. Zimmermanni* n. sp.; it is from German East Africa.

ANATOMY AND PHYSIOLOGY

1351 - **Investigations on the Rate of Resorption of Proteins and their Decomposition Products in the Small Intestine.** — MESSERLI, HERMANN in *Biochemische Zeitschrift*, Vol. 54, Parts 5 and 6, pp. 446-473. Berlin, September 2, 1913.

The results of experiments carried out on an eight months old fox-terrier by means of a Thirn Vella fistula are summarized by the writer as follows:

1. The resorbent power of the mucous membrane of the small intestine diminishes with time and with the course of the experiment. The decrease is caused by a disturbed function of the membrane and can go so far that no more protein is taken up.

2. Of the true proteins that were tested it was proved that the serum of blood was the one best absorbed, gliadin followed next, then casein and lastly haemoglobin. Casein, contrary to what was observed in Friendländer's experiments, was resorbed as quickly as other proteins when the activity of the membrane was normal. The quantity of nitrogen resorbed in 10 minutes averaged 20 milligrams for serum, 16 mgm. for gliadin, 12 mgm. for casein and 8 mgm. for haemoglobin. The rate of resorption of the genuine proteins does not seem to depend upon their degree of concentration.

3. The average quantity of nitrogen resorbed in 10 minutes was 27mgm. for peptone, 27 mgm. for ereptone, and 22 mgm. for hydrolised casein. It is therefore probable that in the intestine not all the protein synthesizes into indifferent blood albumen, but that a considerable quantity of nutritive nitrogen is resorbed as more complex substances, such as albumoses and peptone.

4. Whilst during a first series of experiments it was found that with foods poor in nitrogen and those rich in the same element, the rate of resorption of the proteins and protein decomposition products introduced into the fistula did not differ much, a second series of experiments showed a lower degree of resorption for the former kinds of food than for the latter. The lower resorption in the case of a nitrogen-free food is probably due to a disturbance of the physiological function of the intestinal cells caused by the lack of nitrogen.

5. When all the proteins and even the completely separated decomposition products were no longer resorbed by the mucous membrane of the intestine, it was found that the resorption of grape sugar did not differ from that normally observed. It follows that the splitting up of protein does not lead to a power of resorption like that of grape sugar.

1352 - **Cyanogenesis under Digestive Conditions.** — AULD, S. J. M. in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 409-417. Cambridge, October 1913.

Following on his previous work (1) the writer carried out a number of experiments showing the inhibiting power of cellulose on cyanogenesis from linseed cake by incubating 25 gms. of the cake with various fodders which had been dried and reduced to powder, and also with their aqueous extracts. The action of the extracts was always small and occasionally negative (cyanogenesis was reduced to 90 per cent. of the controls, average of 8 trials) while that of the ground plant was considerable and invariably positive (cyanogenesis was reduced to 71 per cent. of the controls, average of 9 trials); in the case of Helianti, which is a coarse, bulky fodder, not only aqueous extracts were tried, but also ether and alcohol extracts, and in no case was their inhibiting faculty as great as that of the extracted residue. Moreover cellulose was prepared both from filter paper and from cottonwool and proved equally effective, the action being due to the adsorption of the cyanogenetic enzyme by the cellulose. This part of the work is being further developed along other lines.

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(1) AULD, S. J. M. The formation of prussic acid from linseed cake and other feeding stuffs: *Journal of the South-Eastern Agricultural College*, Vol. 20 (1912), p. 289; and *Journal of the Board of Agriculture*, Vol. 19 (1912), p. 416; ID. The hydrolysis of amygdalin by emulsin: *Journal of the Chemical Society*, Vol 93 (1908), p. 1251.

The effect of acids and alkalis on cyanogenesis was also estimated by incubating 20 gms. of the cake in acid or alkaline solutions of various strengths and for different lengths of time. $\frac{N}{100}$ hydrochloric acid reduced cyanogenesis to 9.7 per cent. of its maximum effect, and even $\frac{N}{500}$ hydrochloric acid produced a slackening in the rate of evolution. The alkali appeared rather less effective than the acid as an inhibitor, but $\frac{N}{100}$ alkali reduced cyanogenesis to 27.5 per cent. of its maximum effect and the writer estimated that $\frac{N}{60}$ alkali (which represents the strength of saliva) would prove completely inhibitive. It is to this alkalinity of the saliva that he attributes the innocuous effects of feeding linseed cake to ruminants, as the food would not be within reach of the inhibiting acid of the true stomach for some hours after feeding.

To trace the extent and orientation of cyanogenesis in the animal body, three Hampshire-down tegs were fed with linseed cake before being slaughtered, and after they were killed the stomachs were removed and the contents washed into large flasks and analysed for hydrocyanic acid. The results were as shown in the table (p. 1880).

In each case the paunch contents were alkaline to litmus and the two intermediate stomach compartments either neutral or faintly alkaline; in every case, also, by far the greater part of the meal was still in the rumen. The table shows that a certain amount of prussic acid generation will usually take place from cyanogenetic feeding-stuffs when eaten by animals; also that the greater part of this formation will take place in the paunch in the case of ruminants, and in the fundus portion of the stomach in other animals. The chief limiting factor would appear to be the alkalinity of the masticated food, assisted secondarily by the cellulose present in the ration, and by many of the other food components.

With regard to the conditions of possible poisoning by cyanogenetic feeding-stuffs, the writer remarks that though the nature and alkalinity of the saliva is known to vary considerably, it is doubtful whether the alkali concentration will ever fall sufficiently low to allow prussic acid to be formed in large enough quantity to produce toxic symptoms; he is more inclined to attribute cases of poisoning to the use of feeding-stuffs which

Sheep	Hydrocyanic acid formed, gms.					Percentage of « available » HCN actually formed
	Rumen	Reticulum	Omasum	Abomasum	Total	
No. 1. Given 1 lb. of crushed linseed cake 2 hours before killing	0.03056	0.00388	0.00142	0.00077	0.03663	20.1
No. 2. Given 1 lb. of crushed linseed cake and a few handfuls of hay 2 hours before killing	0.02357	0.00311	0.00160	0.00065	0.02893	15.9
No. 3. Given 1 lb. of crushed linseed cake ½ an hour before killing	0.00906	traces	—	—	0.00906	4.9

contain free acids or which may undergo acid fermentation in the animal body, such as fresh grass, ensilage, etc., together with the cyanogenetic material. Such acid substances are likely to neutralize the salivary alkalinity and suspend its inhibiting powers. Linseed cake fed with acid foods, or imperfectly made linseed gruel or immature sorghum, would thus become dangerous.

Poisoning from Java beans (*Phaseolus lunatus*) seems to form rather a special case and the circumstances generally are so much against prussic acid formation in the animal body that it appears possible that another and unsuspected poison may be present in the seeds of the varieties of *Phaseolus lunatus*.

The small amount of prussic acid formed when cyanogenetic feeding-stuffs are used may be actually beneficial to the animals, acting as a hormone and stimulating the physiological functions in the digestive tract, and may be the cause of the undisputed superiority of linseed cake for fattening cattle. The point is being further investigated by the writer.

BREEDING

1353 – **A Contribution Towards an Analysis of the Problem of Inbreeding.** – PEARL, R. in *The American Naturalist*, Vol. XLVII, No. 562, pp. 577-614. Lancaster, Pa., October 1913.

The writer presents a method for expressing numerically the degree of inbreeding which exists in a particular case by measuring the proportion which the actual number of the ancestors bears to the maximum number possible in that case. The unit of comparison is called the *Coefficient of Inbreeding*, and is written Z; then if

p_{n+1} = possible number of different individuals in the $_{n+1}$ generation
and q_{n+1} = actual » » » » »

$$Z_n = \frac{100\,(p_{n+1} - q_{n+1})}{p_{n+1}}$$

Z rises from 0 to 100 with the degree of inbreeding, and if the value of Z for successive generations in the ancestral series be plotted to the generation numbers as a base, the curve obtained is termed the *Curve of Inbreeding*.

Working with this formula the writer calculated values for Z in three hypothetical cases:

1) continued brother × sister mating ;
2) continued parent × offspring mating ;
3) continued first cousin mating.

	Ancestral generations included	1)	2)	3)
Z_0	1	0	0	0
Z_1	2	50	25	0
Z_2	3	75	50	25
Z_3	4	87.5	68.7	37.5
Z_4	5	93.7	81.2	43.7
Z_5	6	96.9	89.0	46.9
Z_6	7	98.4	93.7	48.4
Z_7	8	99.2	96.5	49.2
Z_8	9	99.6	98.0	49.6
Z_9	10	99.8	98.9	49.8

The above table shows that whereas in the first case the values for Z rise abruptly for the first few generations and then only relatively little change is made by a continuance of this kind of mating, in the second case the rise is less abrupt, but by the time the tenth generation is reached, the values are practically equal to those for the brother × sister mating. In the third case the maximum value for Z never rises beyond 50.

The writer illustrates his method by reference to two actual pedigrees.

1354 - **Preliminary Note on Some Experiments with a Polymorphic Phasmid.** — FRYER, J. C. F. in *Journal of Genetics*, Vol. III, No. 2, pp. 107-111 Cambridge, September 1913.

Among a large brood of stick insects (*Clitumnus* sp.) reared from the egg by Mr. E. E. Green, Government Entomologist in Ceylon, it was noticed that, though the males were all similar, two distinct types of females were present, *viz.* horned green and hornless yellow, while the males were all hornless and chocolate brown. A female of each type was isolated from the brood and, as the males and females had been left together after reaching maturity, it was assumed that both these females had paired. The descendants were as shown in the table (p. 1882).

It is evident that the characters of the presence and absence of horns are Mendelian, as also are those of colouration, and with respect to both it is noteworthy that no intermediates occurred, so that every individual could be assigned directly to one of the four classes. The connection between the possession of horns and the green colour, suggested by the original brood, evidently does not exist and the two pairs of characters are probably quite

Brood Number	Parentage		Males	Females			
				Green		Yellow	
	Female	Male		Horned	Hornless	Horned	Hornless
1	Horned green	× Unknown . .	13	8	3	10	6
2	Hornless yellow	× » . .	4	—	—	—	2
3	Hornless green of brood 1	× of brood 1 . .	48	—	38	—	42
5*	Horned green »	× » . .	30	3	8	8	11
6	Horned green »	Parthenogenetic	—	12	10	—	—
7	Hornless yellow »	× of brood 1. . .	Died young. Some females with horns.				
8	Hornless yellow »	× » . .	10	—	—	1	7
9	Horned yellow »	× » . .	46	4	6	18	23
10	Horned yellow »	× » . .	24	4	2	17	1
11	Hornless yellow of brood 2	× of brood 2 . .	47	—	12	—	43

* Brood 4 died young.

independent of each other. Finally, and most important, is the definite evidence in brood No. 6 of the segregation of Mendelian factors in parthenogenetic reproduction. There appear to be no previous records of this phenomenon and consequently confirmation is desirable ; at the same time the absence of males and the fact that the segregating character is structural seem to be strongly in favour of the correctness of the result.

Assuming that three pairs of Mendelian characters are involved, *viz.* presence and absence of horns, yellow and green colouration, and maleness and femaleness, the results of each brood are discussed separately. On the whole the experimental numbers do not agree well with those expected on the above hypothesis, but it should be noted that there was a very high mortality during the early stages of the insects' life, which may account for some of the discrepancies.

1355 – **The Inheritance of Coat Colour in Horses.** — ANDERSON, W. S. in *The American Naturalist*, Vol. XLVII, No. 562, pp. 615-624. Lancaster, Pa., October 1913.

Using the tables of Sturtevant, Hurst, Wilson and Harper on the inheritance of coat colour in horses, as well as his own relating to the American Saddle Horse, the writer tabulates anew 12 377 matings involving the colour of 37 131 horses.

Chestnut always behaves as a pure recessive, while grey and roan are dominants. The writer examines carefully the chestnut matings with black, brown and bay, as well as the matings of the three latter colours with one another. There are many difficulties in the way of a simple explanation of the results, chief of which are the methods of registration, which make the line of demarcation between the three colours very uncertain and may account for the discrepancies in the tables. The writer suggests the following series of factors .

Chestnut recessive to all
Black dominant to chestnut but recessive to brown
Brown » » chestnut and black but recessive to bay
Bay » » brown » » » gray
Gray and roan dominant to bay.

WORK OF LIVE-STOCK ASSOCIATIONS AND OTHERS FOR THE ENCOURAGEMENT OF BREEDING

1356 - **Live Stock Breeding in Prussia during the Last Twenty-five Years** (1) — HOESCH and HITTCHER in *Verhandlungen des Königlichen Preussischen Landes-Oekonomie-Kollegiums*, pp. 83-117 and 227-241. Berlin, 1913.

The total number of cattle existing in Prussia in the year 1883 was 8 737 641, or 15.4 head per 100 acres of area and 312 per 1000 inhabitants. In the year 1911 the total number amounted to 11 682 234, or 20.5 per 100 acres and 287 per 1000 inhabitants. Between 1883 and 1911 young cattle under the age of two years (including calves) increased by 64 per cent., cattle above two years of age by 19.5 per cent. and cows by 25.5 per cent.

The number of pigs increased in the same period from 5 819 136 to 17 244 855, or from 9.5 to 20.07 per 100 acres and from 210 to 423 per 1000 inhabitants.

In 1883 the number of sheep was 14 752 328, but in 1911 it was only 4 372 489, or 533 per 1000 inhabitants in 1883 and 107 in 1911.

The goats were 1 679 686 in 1883 and 2 235 529 in 1907, or 62 and 58 per 1000 inhabitants respectively.

The amount of meat produced for Prussia from Prussian live stock was 66 lbs. per inhabitant in 1883 and 109.5 lbs. in 1911. In the latter year pork constituted 70.6 lbs., or 64.5 per cent., beef and veal 34.5 lbs., or 31.5 per cent., mutton 2.5 lbs., or 2.24 per cent., horseflesh 1.3 lbs., or 1.2 per cent., and goats' flesh 0.6 lbs., or 0.5 per cent.

The production of meat by Prussian live stock has considerably increased since 1883, but the increase in the number of head of cattle has not kept pace with the increased population. Only the number of pigs increased more rapidly than the population, but the increased production of pork has been accompanied by a diminution of mutton. The writers attribute the greater productiveness of the live stock to the increased average weight of the animals and to their precocity. According to ESSLEN the carcase-weight per head of the cattle slaughtered in Germany rose by 27 per cent. from 1880 to 1905, that of pigs by 5.3 per cent., that of sheep by 17.7 per cent. In 1892 the number of adult cattle slaughtered was 15.8 per cent. of the whole number of the adult stock, while in 1907 it was 19.8 per cent. In 1892, 27.8 per cent.

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(1) For horses, see No. 389, *B.* April 1913. *(Ed.)*

of the cattle under two years of age were slaughtered, and in 1907 35.5 per cent. Of the increased precocity in pigs, evidence is afforded by the fact that while in 1892 77 per cent. of the pigs slaughtered were under one year of age, in 1907 there were 86 per cent. below that age. The number of pigs slaughtered every year in Prussia averages 104 per cent. of the number existing at any one time.

The development of Prussian animal husbandry during the last quarter of a century is clearly shown by statistics on the trade in live stock with the other States of the Empire. While in 1886 Prussia exported 34 498 head of cattle more than she imported, the difference between exports and imports in 1911 rose to 152 196 head ; the capacity of exportation has thus increased in 25 years by 117 698 head, or 341 per cent. In pigs, in 1886 the excess of those imported from the other States of the Empire over those exported was 47 189, while in 1911 there was an excess of exportation of 2 049 948 head ; the capacity of exportation for pigs thus rose by 2 097 137 head. The exportation of pigs into the other States of the Empire was, in 1911, thirty-seven times greater than the importation of pigs into the Empire. The excess of exportation of cattle in the federated States was, in 1911, by 30 458 head lower than the imports into Germany. The yearly greater production of all kinds of meat in Prussia as compared with that of 1883 is in round numbers 1 170 000 tons, or 141.6 per cent.

Like the production of meat, the production of milk has increased in Prussia during the last 25 years, though to a less degree. The value of the milk produced in Prussia in 1911 amounted to upwards of £ 87 000 000. The number of milch-cows has increased from 5 133 226 in 1883 to 6 441 445 in 1911, and the income from milch-stock has reached that derived from bread cereals. For the whole Empire, the value of milk and milk products was calculated in 1912 to be somewhere about £ 150 000 000. Besides this home production, the imports of milk, butter and cheese amounted in 1911 to about £ 9 400 000. The imports of milk and milk products into the German Empire exceeds by about £ 8 430 000 the exports of the same products and is £ 50 000 more than the imports of meat and live stock.

The progress achieved in Prussia during the last 25 years in live stock breeding is shown also by the build of the animals, as can be seen at the shows of the " Deutsche Landwirtschafts-Gesellschaft " (German Agricultural Society). Many breeds of cattle have become fixed in this time, their shapes have improved and their strains become uniform. Great progress has especially been made in pig breeding by the creation of new breeds, such as the Improved German (" Deutsche Edelschwein "), the Improved Country pig (" Veredelte Landschwein ") and the Hanoverian Black-spotted pig. The progress in goat breeding is such that it has become independent of foreign countries.

In the last quarter of a century breeding associations have been founded and herdbooks started. The success which has attended these departures may be judged from the following table :

Year	Number of Breeders' Associations				Number of performance testing associations	Number of cooperative associations for the sale, etc., of live stock
	cattle	pigs	sheeps	goats		
1888	14	—	4	—	—	—
1913	523	139	6	573	c 500	c. 200
Increase	509	139	2	573	c. 500	c. 200

Of all the breeders' associations in 1912, 434 were under the control of the "Deutsche Landwirtschafts- Gesellschaft". The Chambers of Agriculture worked in harmony with the special associations for the progress of cattle breeding, a great portion of the State subventions passing through their hands. In the year 1903 the sums paid by all the Prussian Chambers of Agriculture for the promotion of stock breeding amounted to £ 95 658, and in 1910 to £ 155 644. The State subvention amounted in 1888 to £ 13 700 for all branches of stock breeding with the exception of horses, and in 1913, including the additions from the "East and West funds" (1), to £ 86 000 in round numbers.

For the supervision of breeding work and for advising breeders there are at present in Prussia 73 Inspectors of breeding and (without considering clerks and the like) some 200 other agricultural officials who occasionally assist in the work. In the year 1888 no Inspectors or agricultural officials had yet been appointed.

The breeders and officials are educated in nine agricultural colleges, in 18 agricultural middle schools and 229 lower schools. There are, besides, associations like the "Deutsche Landwirtschafts- Gesellschaft", the "Deutsche Gesellschaft für Züchtungs-kunde" (German Live Stock Association) and the "Königliche Preussische Landes- Oekonomie-Kollegium" (Royal Prussian Committee on Agricultural Economy) which offer abundant opportunities for instruction by holding lectures and publishing technical works and leaflets.

Lastly the writers discuss the measures to be adopted for the further progress of stock breeding in Prussia; in agreement with the "Landes-Ökonomie Kollegium" they lay down the following lines:

1. Statistiscal information for practical breeders on the present situation and duties of stock breeding from the point of view of private and public economy and a clear demonstration of the causes of success or insuccess in stock keeping.

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(1) These are two permanent funds for the improvement of the agriculture of the country and from which stock breeding also is assisted. (*Ed.*).

2. Promotion of colonisation in all places where the present distribution of property opposes the extension of stock breeding.

3. The most careful observation of the diminution of live stock which is taking place in many localities, for technical reasons, in connection with the cultivation of sugar beets both on large and on small farms, and furthering of all endeavours in favour of improved breeding, and of the spread of performance test associations.

4. Closer union between the Chambers of Agriculture and small farmers.

5. Inducing the local live stock insurance associations to assist the smallest owners of stock, especially pig-keepers.

6. Promoting a cheaper and a more hygienic way of keeping stock, especially among small farmers, by means of permanent pastures.

HORSES, ASSES AND MULES

1357 - **Feeding Experiments with Dried Beer Yeast for Horses.** — CZADEK, OTTO VON in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year 16, Part 9, pp. 879-889. Vienna, September 1913.

The experiment was conducted on two horses with the object of ascertaining if yeast can replace oats in the rations, or not. The horses, weighing about 880 lbs. each, were given during the experiment, which was divided into three periods of seven days each, the following daily rations divided into three feeds.

Fodder		Period 1.		Period 2.		Period 3.
		Horse I	Horse II	Horse I	Horse II	Horse II
Hay	lbs.	6.6	6.6	6.6	6.6	6.6
Chaft	»	2.6	2.6	2.6	2.6	2.6
Oats	»	6.6	3·3	3·3	6.6	—
Yeast	»	—	0.66	0.66	—	1·3
Potato-meal	»	—	1·3	1·3	—	2.6

Feeding potato-meal with yeast instead of the half or full ration of oats was carried out simply with the object of replacing the carbohydrates wanting in the yeast. As the digestible protein content of the meal is low, it might be expected that the utilization of the fodder given with it would be rather diminished than increased. Before the commencement of the experiment, and between one period and the other, a preliminary feeding period of four days was introduced. During the experiment the animals did not work; they were, however, taken out every day and exercised at a foot pace.

In order to determine the degree of utilization of the fodder this was always carefully weighed and examined before being given to the horses, whose droppings were also examined daily.

From the results given in tables, it appears that by replacing half of the rations of oats by yeast, all the nutritious elements, with the exception of fat, were better utilized than with the full rations of oats. The substitution of the whole ration of oats by yeast has the consequence that besides fat, crude fibre also was less utilized.

The effect of yeast was better when half the oat ration was substituted than when the whole was replaced. In both cases, however, the utilization quotient stood higher than with the full ration of oats. As to how far yeast is superior to oats for putting on flesh could not be determined, owing to the shortness of the time covered by the experiment. Feeding on yeast caused no change in the droppings. The writer concludes from the experiment that in practice it is possible to replace with success at least a part of the oats by yeast.

1358 - **Mule Breeding in Poitou** (1), **France.** — FOUCHARD, P. and HOUMEAU, A in *La Vie Agricole et Rurale*, Year 2, No. 33, pp. 188-195. Paris, July 19, 1913.

Mares. — The mares used in Poitou for the breeding of mules are of northern origin and their ancestors were probably imported about three hundred years ago from Holland and Flanders. They are powerfully built heavy animals that have a strong resemblance to mules and are therefore considered specially adapted for the breeding of the latter. Their withers height averages 15 ¼ to 16 ¼ hands ; the head is long and thin, the lips overhanging and the ears pointed and long. The neck and chest are flat, the legs powerful but coarse and very hairy. The colour of the coat is various.

For the improvement of the breed, about the year 1860 Flemish stallions were introduced, later Percheron and Boulogne stallions and Breton mares. For the last thirty years a Studbook Association has existed. The improved breed is composed of animals with more powerful necks and chests than those of the unimproved strains. The best mares are mostly found in the moor districts of La Vendée and of the Department of Deux Sèvres.

The mares are served between February and June; the foals are usually weaned at the age of six months. For the production of mules, fillies begin to be used at the age of two years. Fillies of this age, at the chief market, Chaillé-les-Marais, fetch from £24 to £36. Colts somewhat over two years make £32 to £48 and upwards.

Jacks. — The jacks used for the production of mules are commonly called " baudets ". They have powerful heads, long and large ears, small eyes and deeply built bodies, with round cruppers, and coarse legs with small hoofs. The colour should be dark; light coats and black muzzles are avoided. For breeding purposes, jacks with long and curly hair are preferred, as their offspring are credited with putting on flesh better than others.

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(1) See No. 711, *B.* June 1913. (*Ed.*).

The jack is always kept in the stable, and fed on hay straw and some oats. During the service season the rations are increased and some wheaten or rye bread is added to them. The breeding of " baudets " is limited exclusively to private studs in the district of Melle in Poitou. The asses are mated in August and September, immediately after the close of the service season for mares. After weaning, which takes place at the age of nine months, the foals are kept in stables. They begin to breed at the age of 2 ½ years.

The sales of jacks are held at the owners' stables. At the age of nine or ten months the animals are worth £40 to £100, at the age of 2½ years £80 to £160, and at 4 years they are paid £200 to £240. First-class animals have not infrequently fetched £320 to £400. The trade in she-asses is insignificant; they are sold at between £16 and £60.

Mules. — The mule of Poitou is especially suited for heavy work. Its neck is broad and muscular, its back is straight, the chest broad and deep, the loins broad, the croup round, the legs very powerful with broad joints and small cylindrical hoofs. It stands 14 ¼ to 15 ¼ hands high. Its hair is short, rough and generally dark coloured. If the muzzle, the inside of the edge of the ear and the insides of the thighs and fore legs are silver-white, then the black colour of the coat is called " boyard " : if these spots fail, the coat is described as " bouchard ".

The young mule accompanies its dam in the pasture until it is weaned, usually at the age of seven or eight months. After this it is fed in the stable and when it is two years old it is broken in. Preparatory to being sold abroad at the age of three or four years, the animals are kept in dark stables and fed with good hay, barley, oats and maize. They are sold only at the farms. Recently weaned foals are mostly sold to the Dauphiné, Provence, Charente and the northern part of Vienne. The prices range from £24 to £40. Fattened foals from Poitou at prices of from £36 to £76 are imported by Spain, the province of Languedoc, Algeria, Belgium, Germany and Italy. A certain number of mules are exhibited every year in Paris at the general live stock show. For the improvement of the breeding of mules, the most important step would be better support on the part of the State.

CATTLE

1359 - **Comparative Trial of Ostfriesland and Simmental Cows in Hungary.** — UJHELYI, E. in *Oesterreichische Molkerei-Zeitung*, Year 20, No. 14, pp. 215-217; No. 15, pp. 231-233. Vienna, July and August 1913.

A test was made throughout the year 1912 at the Agricultural College at Magyaróvár to determine whether the Ostfriesland or the Simmental was the more suitable milch-cow for Hungary. The Ostfrieslands were 22 four-year-olds, some black and red, others whole red; they were imported from their native country; all but one calved normally. The Simmentals were 33 six-year-olds bred on the farm; twelve of them aborted. All the cows were recently calved when the trial began, and they averaged 340 days in milk. The chief results are shown in the accompanying table.

Breed	Average milk yield	Fat content			Production per 100 food units (*)		Performance of best cow	
		max.	min.	av.	milk	butter	food units consumed	milk produced
	lbs.	%	%	%	lbs.	lbs.		lbs.
Ostfriesland.	8 096	3.51	2.51	3.02	236.5	7.83	3 746	11 273
Simmental	7 590	4.26	3.0	3.6	235	9.46	3 771	13 438

(*) The food unit adopted was 1 kg. (2.2 lbs.) of concentrated food, consisting of a mixture of bran, oilcake and groats.

The writer notes that the yield of the Simmentals was very likely reduced owing to the number which aborted; but he believes the Ostfriesland to be a more economical milk-producer in Hungary, and that it should be adopted on farms which have a plentiful supply of fodder and aim at quantity of milk.

1360 - **Comparative Fattening Experiments on Marsh and Moor Pastures in Germany.** — TACKE, in *Jahrbuch über Neuere Erfahrungen auf dem Gebiete der Weidewirtschaft und des Futterbaues*, Year 1, pp. 17-33. Hanover, 1913.

Experiments have been begun on the fattening of bullocks on a moor pasture and a marsh pasture.

1361 - **The Zigaya Sheep.** — RODICZKY, VON in *Zeitschrift für Schafzucht*, Part 10, pp. 228-233. Hanover, October 1913.

The Zigaya sheep, known also under the names of Czigáj, Czigárka, Czik and Berkĕ, is the predominant breed for the production of wool in the south-east of Europe, especially in the Balkan countries; besides being bred for its wool it is also kept for its milk and flesh. The wool of the thoroughbred animals is a pure white, but most of the Zigaya wool in commerce is mixed and generally gray or streaked with black. The best Zigaya wool is suitable for cloths. Some decades ago Zigaya wool was exported in large quantities to Western Europe.

In the Balkans the Zigaya sheep form the flocks of the wandering shepherds, who pay no attention to the breeding of their animals. There are very few pure breeds and a uniform type is rarely to be met with in the flocks. For the improvement of the breed, Merinos, Hampshires, Friesian Milk sheep and even Charmoise Mutton sheep have been introduced, but to a limited extent. The use of Friesian rams led to an increase of the milk yield and an improvement in the quality of the wool, while the Hampshire blood caused a better conformation of the body and greater prolificness, but a deterioration of the fleece. The Merino rams bettered the quality of the wool. Zigaya sheep are often mated with Zackel sheep, which are raised in their neighbourhood, and from which, notwithstanding the data found to the contrary in the literature on the subject, they are easily distinguished. Recently the efforts of breeders in several localities have been turned to a rigorous selection and to the elimination of the Zackel blood. The State in Hungary assists these endeavours by breeding good rams in the stud farms at Fogaras and Kolozstorda, and in the agricultural schools at Algyógy, Szent Imre, Rima and Szombat and selling them to sheep breeders. At Fogaras the constant climination of spotted lambs has already succeeded in producing a perfectly white fleece and destroying the last traces of Zackel blood. At Kolozstorda and in other localities, suitable selection for a short time has resulted in increasing the height at the withers, the girth and the live weight of the breed

The pure-bred Zigaya sheep is well built and its size is intermediate between the large Zackel sheep and the common wool sheep. At Fogaras the live weight of an improved two-year-old ram averages 94 ½ lbs., of ewes in milk 77 to 86 lbs. Old rams may reach 132 to 143 lbs., and old ewes 97 to 110 lbs. The Zigaya sheep have a small clean head with a tapering muzzle. The horns, when present, are ringed and curved in a spiral; if they are not spirally curved, as in the Banata Zigaya, it may be inferred that Zackel blood has been introduced. The rams are almost always horned and the ewes hornless. The face and legs are mostly covered with short stiff black hairs. White legs show, according to the writer, the presence of Merino blood Often individuals with coffee-brown and rusty legs or black and brown spots on the face occur; the latter seem specially suited for the production of milk and the black-headed animals for meat. The latter are highly esteemed in the meat markets of Vienna and Constantinople.

The milk production, as in the Zackel breed, is about 26 to 44 quarts per annum, averaging 31. It is richer in fat than the Zackel milk, and this shows also in the increase of size of the suckling lambs. At Kolozsmonostor, after standing 48 hours, Zigaya milk gave from 19 to 29 per cent. of cream, while Zackel milk yielded only 15 to 23 per cent. The lactation period varies according to the conditions of the pastures, and lasts, according to observations made at Algyógy and Fogaras, 125 to 135 days. At Algyógy the daily yield of milk was found to be 0.253 quart (= 0.086 lb. of cheese) per head. and at Fogaras 0.295 quart (= 0.130 lb. of cheese).

Lastly the writer states that the Stogosch and Burzan sheep, existing together with the Zigaya sheep and mostly considered as a separate breed, are only a cross between Zigaya and Zurkan sheep.

1362 – **Digestibility Experiments with Sheep. Para Rubber Seed Cake.** — AULD, S. J. M. in *The Journal of Agricultural Science*, Vol. V, Part 4, pp. 429-433. Cambridge, October 1913.

The writer undertook a feeding trial with three Kent sheep to determine the digestibility of a cake made from Para rubber seeds, which are at present available in considerable quantities and likely to become more so in the future. The cake was light brown and very friable, and when tested for prussic acid failed to give any reaction, though the seeds themselves yielded 0.048 per cent. Its composition was as follows :

	per cent.
Moisture	9.27
Crude protein	29.84
Crude fibre	3.15
Ether extract	20.11
Nitrogen-free extractive matter	33.08
Ash *	4.55
(*Containing sand	0.23)

The sheep received 450 gms. of cake per day in addition to a basal ration of 900 gms. of chaffed hay and 450 gms. of linseed cake ; they ate their food readily. The experiment was divided into four periods :

1). 7 days of basal ration without collecting faeces.
2). 8 » » » faeces being collected.
3). 8 » » » + Para cake without collecting faeces.
4). 8 » » » » » faeces being collected.

The coefficients of digestibility for Para cake were as follows.

SHEEP	Ether extract	Crude fibre	Crude protein	Nitrogen-free extract
1	97.4	100 *	97.5	96.7
2	97.1	100 *	91.2	92.7
3	97.3	100 *	84.0	96.7
Average	97.2	100	90.1	95.3

* Containing sand.

The experiments gave results which are fairly concordant. In each case the crude fibre of the Para rubber seed cake shows a digestibility coefficient actually greater than 100 per cent. The reason for this is not very obvious. Possibly the Para cake offered a better medium for bacterial growth, or it may itself contain a cellulose-splitting enzyme. The excess was not, however, very large, and there seems little doubt that practically the whole of the small amount of fibre of the rubber cake was digested.

The figures obtained show the Para cake to be one of the most digestible concentrated foods available. This is no doubt partly due to the small amount of crude fibre present. This and the absence of mucilage, as in linseed cake, means a lack of " binding " material and probably accounts for the extreme friability of the product.

FISH

1363 - **Investigations into the Causes of Furunculosis** (1). — Fehlmann, W. F. in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 70, Part 7, pp. 384-407. Jena, September 13, 1913.

The writer conducted his experiments, which lasted almost two years, at the Institute for Pathology at the University of Graz. It appears that *Bacterium salmonicida* is nothing else than a motionless strain (with immovable flagella) of bacteria which are normally mobile. The movable and the stationary types are distinguished from each other by the terminal flagella, which in the former are wound like spirilli and in the latter are straight. On applying fish agar with 2.7 per cent. of normal soda solution, the movable type can be transformed into the motionless one. The movable type loses its mobility in the body of a salmonid and causes furuncles like the stationary one. Both forms cause a brown colouring to appear on the nutritive medium, much more rapidly on fish agar than on common, slightly alkaline agar.

In growth and form the mobile type resembles very closely *Bacterium fluorescens*. The writer considers it probable that the several "species" producing furuncles belong to one and the same group of bacteria, which descends from strains of *Bacterium fluorescens liquefaciens* and *non-liquefaciens*. *Bact. salmonicida* can therefore, thanks to its great variability, appear sometimes as a harmless denizen of the water or a saprophyte, at other times as a more or less virulent cause of disease. Unfavourable conditions of life predispose the fish to infection and render the bacterium more virulent, while favourable conditions have the opposite action. The writer believes infection to be caused rather by a wound in the muscles than through the intestines. The paper contains an exhaustive account of the experiments made.

FARM ENGINEERING.

AGRICULTURAL
MACHINERY
AND
IMPLEMENTS

1364 - **Motor Plough Competition at Galanta in Hungary.** — Lindner, E in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 76, p. 906. Berlin, September 20, 1913. — Thallmayer, V. in *Wiener Landwirtschaftliche Zeitung*, Year 63, No. 84, p. 951. Vienna, October 18, 1913. — Martiny in *Maschinen-Zeitung*, Year 11, No. 19, pp. 225-232. Berlin, October 1, 1913.

This motor plough competition was organized by the local agricultural association (" *Landes Agrikulturverein* ") under the patronage of the Hungarian Ministry of Agriculture. The technical and practical agricultural test began in the second half of the month of July of this year and should have ended with the public trial on August 9 and 10. Owing, however, to the great number of machines, some were not tried till after August 10. On the whole 26 ploughs were tried.

The Committee published on August 9 and 10 the results of the tests of the machines that had been tried; these results are collected in the accompanying table (pp. 1894-5).

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(1) See No. 1275, *B*. Nov. 1913' (*Ed.*).

The data given in the table as to time and consumption of fuel, etc., are those obtained from an area 5 hectares (12.35 acres) in extent ploughed to a depth of 8 1/4 inches. The weather from the beginning of the trials until August 10, almost without exception, was favourable and did not cause any appreciable difference in the working of the machines. On August 10 the machines that had not yet been tested were: the 100 H. P. Case tractor, 25 H.P. Harvester, 40 H.P. Twin City, 85 H.P. Big four (six cylinders), 60 H.P. Hart Paar, 60 H.P. Gripp, 60 H. P. Köszegi and a double-engine Schlick-Nicholson outfit.

The results of the trials will be published by the Committee in the form of a book in the Hungarian, English and German languages; applications for the book are to be made to the above-mentioned association.

Name	System	H.P.	Time		Fuel	Specific gravity
			hrs.	min.		
Case	Steam tractor	80	6	3	Coal	—
Case	Benzine tractor	40	10	14	Benzine	720
Caterpillar	»	60	5	54	»	760
Harvester	»	30 to 60	9	31	»	720
Titan (Hung.)	»	90	8	17	»	760
Lanz	Benzine rotary digger	60	10	53	»	720
Twin City	Benzine tractor	25 to 45	8	21	»	720
Fairbanks	»	25	11	9	»	720
Big four (4 cylinders)	»	4 to 85	6	54	»	720
Avery	»	31	14	15	»	720
Wiss	Motor plough	80	9	35	»	720
Fürst Stollberg	Benzine tractor	50	11	22	»	720
Mc Laren	Steam tractor	100	6	13	Coal	—
Mc Laren	»	50	8	3	»	—
Kenna	»	90	8	17	»	—
F. Kornnick	Motor plough	90	6	41	Benzine	720
Stock	»	50	9	47	»	720
Stock with reversing motion	»	50	8	48	»	720
Akra	»	80	6	46	Benzol	880
Akra	»	80	6	46	Benzine	760

1365 – **The Motor Plough Competition at Parma, Italy.** — *L'Agricoltura Moderna*, Year XIX, No. 20, p. 237. Milan, October 16-31, 1913.

The international competition of machines for working the soil organized by the Italian Touring Club under the patronage of the Ministry of Agriculture, Industry and Commerce, and held in Parma during the months of July and August of this year, has awakened much interest among the best known machine builders of the world. About thirty power ploughs of the most different systems were exhibited. Prizes were awarded to the benzine and petroleum motor ploughs of the following firms: Pavesi, Tolotti and Co., of Milan; the Stock Motor Plough Ltd., of Berlin; the Compagnie Internationale des Machines Agricoles de France, of Chicago and Paris; Emerson Brantingham Implement Co., of Rockford; Alberto Baroncelli,

Consumption of fuel lbs.	Oil — lbs.	Grease — lbs	Water — lbs.	Number of workmen required	Cost of cart for implements, coals and water	Total cost per acre in Hungary		Nature of soil
						s	*d*	
2 232	14.3	8 6	15 140	2	10 *s* 0 *d*	3	11	Heavy
253	19.8	0 4	68	2	—	4	8 3/4	Light
201	32.1	2 4	158	2	—	2	10 1/2	»
400	19 4	0 9	1 136	2	—	7	0 3/4	»
477	48.4	0 2	23	2	—	5	7	
353	6 6	2 2	43	1		5	9 ¼	
316	46 6	0.4	33	2	—	6	1 ½	»
371	5 1	2 2	1 226	2	2 *s* 6 *d*	6	5 ½	»
407	36 1	1 4	76	2	—	7	2 ¼	
305	34 1	0.7	422	1	—	5	8 ¼	»
216	40.3	—	200	1	—	4	4 ¼	»
392	2.9	0.2	—	2	—	6	5 ½	Heavy
1 374	13.0	—	12 837	2	10 *s* 0 *d*	2	9 ½	»
1 330	18.7	—	8 347	2	10 *s* 0 *d*	3	0	»
1 840	6 2	12.8	10 560	2	10 *s* 0 *d*	3	7	»
239	19 8	2.9	50	2	—	4	4 ½	»
227	47 5	1.1	6	1	—	4	8 ½	»
233	28.6	0.7	20	1	—	4	4	»
258	5.5	0.4	34	1	—	3	4 ½	»
258	5 5	0.4	34	1	—	2	6 3/4	»

of Ravenna; " Otav ", of Grumello; Giovanni Montini, of Orvieto. Besides these, the steam traction ploughs of the following firms were also awarded prizes: John and Henry Mac Laren, of Leeds; Charles Burrell and Son, of Thetford; Marshall Sons & Co. Ltd., of Gainsborough; Clayton and Shuttleworth, of Lincoln; Avery Company, of Peoria, and lastly the ploughing outfits on the cable system of Francesco Casali e Figli, of Suzzara, and Violati Tescari, of Ariano.

In connection with this competition there was also an international and national competition of combustion motors for agricultural purposes, in which a classification of the machines exhibited was made by awards of prizes in money and of medals.

1366 - **Competition of Beetroot Lifting Machines in France** (1). — SAGNIER, H. in *Journal d'Agriculture Pratique*, Year 77, Vol. II, No. 40, pp. 439-442. October 2, 1913.

The trials took place on September 23 and 24, 1913, on a 20-acre field in the neighbourhood of Saint-Quentin (Aisne). The ground was slightly inclined, and in a very favourable condition of moisture. Seven makers (5 French and 2 Belgian) showed about 30 machines.

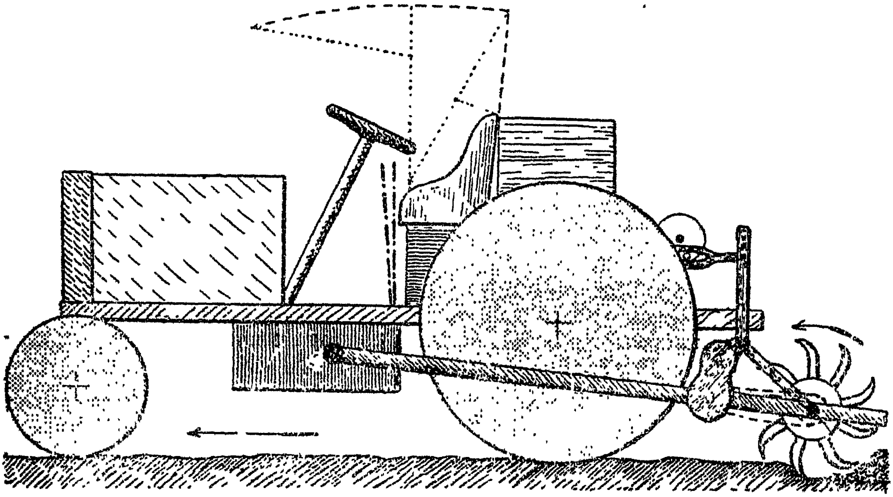
The first class prizes were awarded to :

1. An outfit on the Degrémout system which lifts, tops and cleans three rows of beets at a time.
2. Guichard's one-row machine, which lifts and tops the beets and lays them in small heaps.
3. Laloux and Bridoux' lifter ; also a one-row machine which lifts and tops the beets but does not collect them.
4. Another Guichard machine, a three-row one.

The writer gives a detailed description with figures of the Degrémont outfit, consisting of two machines (beet topper and beet lifter) which work in succession. In the Guichard system the beets are topped, pulled out of the ground and laid in heaps by only one machine.

1367 - **Vermont-Quellennec Rotary Digging Machines.** — DE CONDÉ, F. in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 112, Vol. 120, No. 2, pp. 369-371. Paris, August-September-October 1913.

The writer gives a detailed description of the machine shown in the accompanying illustration and of its working.



Vermont-Quellennec Rotary Digger.

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(1) See No. 970, *B*. Aug. 1913. (*Ed.*).

The motor is of 40 H. P. It can travel at four different speeds, namely 3 ½, 2 ¼, 1 ½ and 1 miles per hour. Its weight is 5.4 tons. According to the data furnished by the Commission of the "Automobile Club of France" it gave the following results at the trials conducted at Bourges :

	First day	Second day
Breadth of land tilled	67 in	67 in.
Average depth of work	5.22 »	6 38 »
Speed per second	15.35 »	—
Area tilled	1.88 acres	0.72 acre
Time required per acre	2 h. 46 min.	—
Consumption of fuel per acre	7.20 gals.	—
Volume of earth loosened for one gallon of fuel.	2616 cub. ft.	—

This machine is built also in another size which is driven by a 60 H.P. motor and tills a strip 71 inches wide.

1368 – **Hand Drill with Revolving Tube.** (German Imperial Patent 264570). — *Maschinen-Zeitung*, Year 11, No. 21, pp. 256-257. Berlin, November 1, 1913.

This portable drill is of simple construction; it is easy to work and it effects a considerable saving of seed.

It consists in the main of a seed hopper, provided with a belt for the convenience of carrying and whose funnel-shaped outlet issues into a horizontal zigzag-shaped revolving pipe, which ends in an immovable chamber leading to an elastic tube. The further extremity of this tube is fitted with a nozzle attached to a rod, by means of which the nozzle may be directed where required.

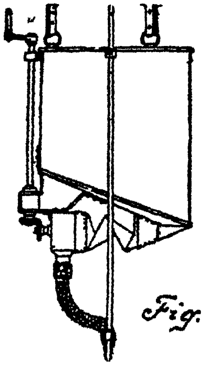


Fig. 1.

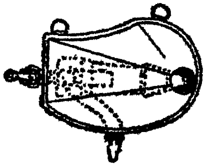


Fig. 2

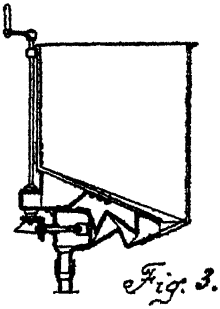


Fig. 3.

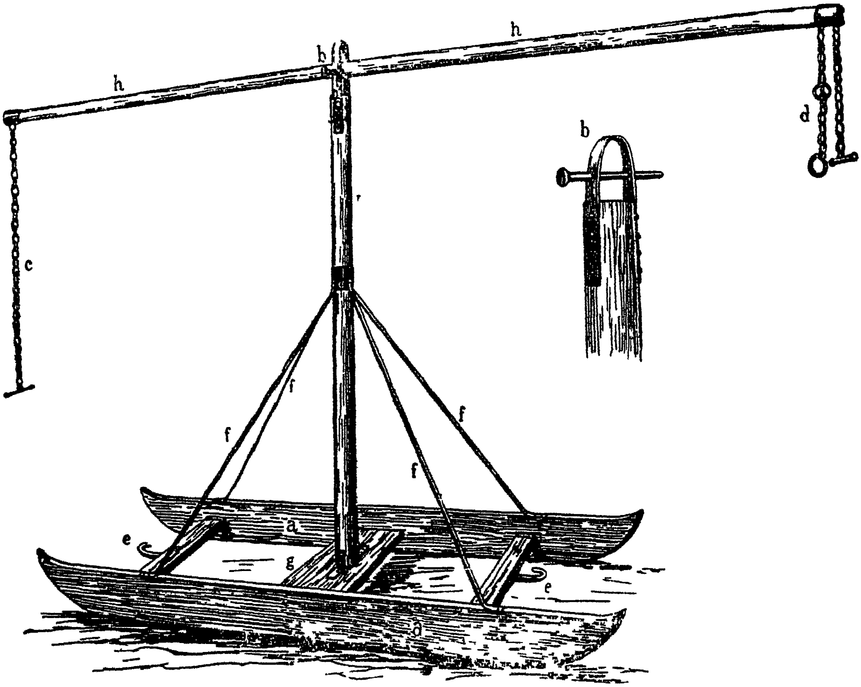
The zigzag pipe is made to revolve by means of a hand crank and toothed gear, and according to the speed at which it is turned, more or less seed is sent into the elastic tube.

Fig. 1. shows a side view, Fig. 2 the plan and Fig. 3 the vertical section of the hand drill.

1369 - **Apparatus for Lifting Straw for Thatching Stacks.** — *Deutsche Landwirtschaftliche Presse*, Year 40, No 74, p 882. Berlin, September 13, 1913

With the apparatus shown in the acompanying figure, the work of lifting straw for thatching is much facilitated.

The working of the apparatus is very simple: when the pressed straw has been taken up by the chain (*d*), a man pulls the chain (*c*) and thus raises the straw to the top of the stack, where a man receives it, frees it from the chains and spreads it on the stack. On releasing the chain (*c*), the lever arm sinks again by its own weight to its former position.



1370 - **Trial of a Barley Drying Plant.** — HOFFMANN, F. in *Wochenschrift für Brauerei*, Year 30, No. 36, pp. 484-488 Berlin, September 6, 1913

The dryer shown in the accompanying figures consists essentially of a hopper, the bottom of which is formed by two frames inclined at an angle of 40° to the horizontal. Where they meet they form an adjustable slit which gives admission to an endless screw situated below it.

The cereal is conveyed on both sides through sliding openings.

On both sides there are three rows of slides. When the lowest slides are opened, the frames get charged with grain to a depth of 16 inches. When

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(1) See No. 1074 *B*, Sept. 1913 (*Ed*)

this layer is heated to 104° F. (40° C.) the next row of slides above it is opened and a layer of moister grain 8 inches deep is formed over the first and already drier layer. When this also reaches 104°, the third row is opened and another layer of barley 8 inches deep is admitted. After about an hour this also has reached the desired temperature; the barley is cooled, let out below and conveyed by the endless screw to an elevator. The driving power is supplied by an electromotor.

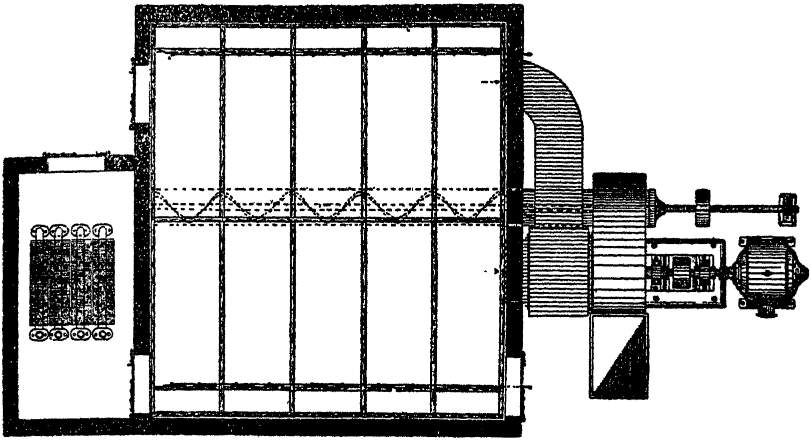


Fig. 1. — Plan.

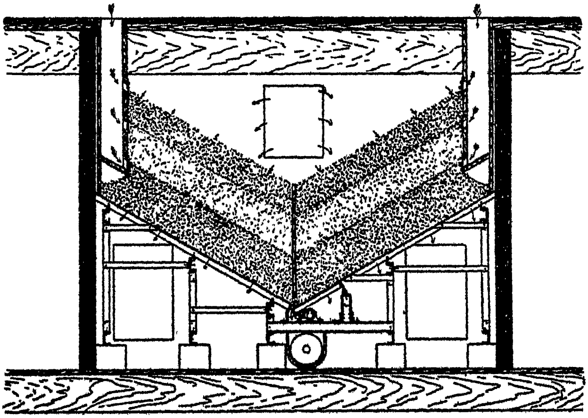


Fig. 2 — Vertical section.

The trial of the apparatus took place on May 20 and 21, 1913 ; the report contains a detailed account of the test ; the results yielded on analysing the dried and undried barley are given in a table. The general verdict was :

1. The dryer is of simple construction, the cost of installation is not high and interruptions in its working are hardly to be feared.
2. The performance of the dryer is, considering its small size, fairly good.
3. The cost of drying is not high, notwithstanding that the ventilator shows an extremely high consumption of power.
4. The cost for removing one pound of water is in reality rather low.
5. The power of germinating has not been impaired, for the deviations observed before and after drying are within the limits of error.

1371 - **Alfalfa-curing Device for Rainy Countries.** — WING, JOSEPH E. in *The Breeder's Gazette*, Vol. 64, No. 13, p. 560. Chicago, September 24, 1913.

The annexed illustrations represent a device for drying alfalfa during rainy weather, which is at present used in Mississippi. It consists of simple home-made trucks of cheap construction resting on a pair of low iron wheels, thus differing advantageously from similar devices in its easy transportability. Fig. 1 shows the truck, which has a short leg in front that doubles under when it is moved forward. What would make about 500 pounds of cured hay is placed on each truck, and covered with a canvas cover under which the hay is as though it were under a little tent, not touching the ground. The loader trucks are left in the field until the hay is quite dry and ready for baling. These trucks are used also for other purposes : to gather cotton or corn or any other crop. The trucks can be attached to each other and a team of mules readily draws fifteen empty trucks. Fig. 2 shows the trucks in a cotton field ; fig. 3 loading up in a field ; fig. 4 a train of empties.

1372 - **Potato Drying Plant.** — VOSS, H. in *Zeitung für Spiritus und Stärke Industrie*, Year 14, No 10, pp. 220-222. Munich. October 1, 1913.

After discussion of the conditions favourable to this industry, so useful to agriculture, with special considerations on the recent progress in cylinder drying apparatus, the writer gives some economic calculations on potato drying installations of different sizes and capacities, according to which the total working expenses for a one-drum "Tatösin" desiccator (1) (cost of installation and machines, interest and amortization, running expenses and working expenses proper) for installations working 120 days of 22 hours each per year, are as follows :

	£	s
Treating 3 000 metric tons of potatoes	869	10
» 5 000 » »	1195	5
» 9 000 » » »	1791	18
» 12 500 » » »	2274	17

Consequently the cost of drying one English ton of potatoes is respectively: 5*s* $7^1/_4$*d*, 4*s* $10^1/_4$*d*, 4*s* $0^1/_2$*d*, 3*s* $8^1/_4$*d*.

(1) See No. 1074, *B*, Sept. 1913. (*Ed.*).

Fig 1

Fig.

Fig 3

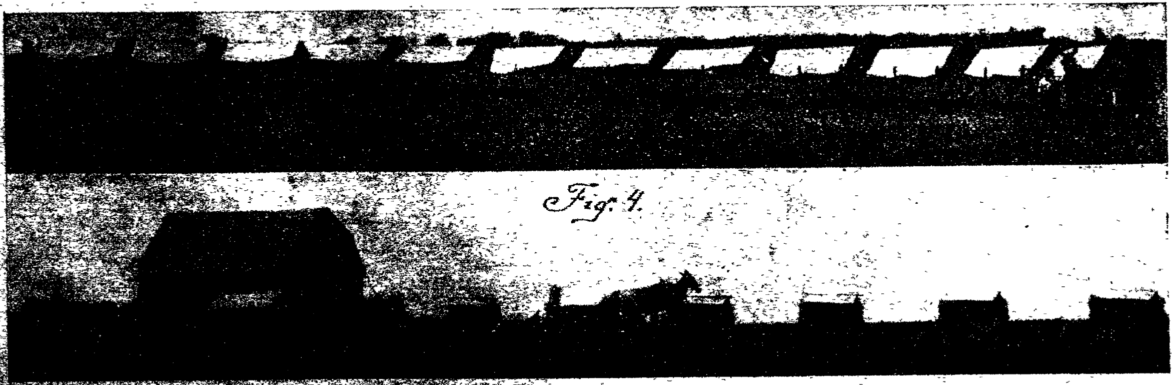
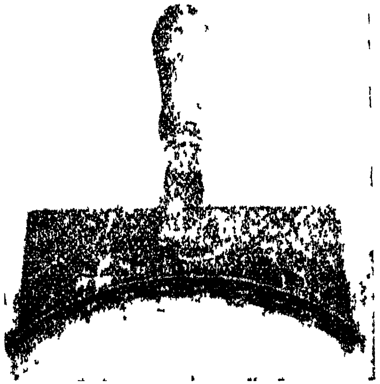


Fig. 4.

1373 - **A New Instrument for Tapping Castilloa.** — *The India Rubber World*, Vol. XLIX, No 1, p 9 New York, October 1913

The wounds caused by the tapping methods at present in vogue heal slowly and unsatisfactorily. Instead of removing a strip of bark, it is more advantageous only to raise it and allow the latex to flow. The part raised is replaced and the wound heals very quickly.

The secretaries of the Abispo plantation have invented an instrument (see fig.) which gives excellent results. It is possible to adjust the knife so that it penetrates the bark without damaging the cambium.



1374 - **Test of a "Westphalia" Milk Separator capable of working 330 Gallons per Hour.** — WIRTH in *Oesterreichische Molkerei-Zeitung*, Year XX, No. 20, pp 317-319. Vienna, October 15, 1913

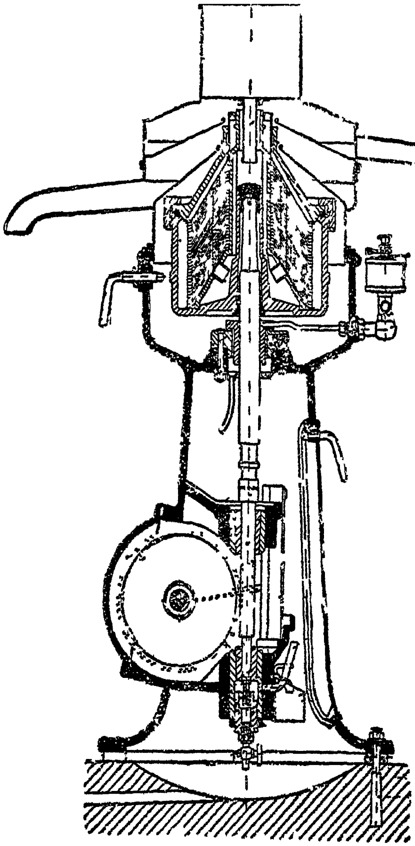
The writer begins by giving a description of the machine shown in section in the figure on the next page, and then reviews the experiments made with it and their results.

The machine was set up in the cooperative dairy at Gross Grünau, where during the eight months between December 1, 1912 and August 1, 1913, it treated daily from 660 to 770 gallons of milk.

On the test days samples of the whole milk, skimmed milk and cream were taken every 30 minutes and examined for fat content by Gerber's method. The examination for fat content of the skimmed milk was also carried out according to Gottlieb-Röse's analytical process. These determinations were made in the laboratory of the German Agricultural Academy at Tetschen-Liebwerd in Bohemia.

The most important data and figures are collected in tables. At a temperature of 95° F. (35° C.) with a cream containing 15 per cent. of fat and working at the rate of 330 gallons per hour, the skimmed milk contained only 0.05 per cent. of fat; at a higher temperature this was reduced to 0.01 per cent. The increase in fat-content of the skimmed milk on separating at a lower temperature or with a lower percentage of fat in the cream was only 0.004 to 0.01 per cent.

These tests show that the machine works very well, and that even under difficult conditions the separation is very perfect. As no hitch in the working occurred during the eight months, and as the machine is of simple construction and easy to clean, it may be recommended, and is likely to last well.



RURAL ECONOMICS

RURAL ECONOMICS.

1375 - **Acreage under Crops and Grass in England and Wales in the Year 1913.** — *Board of Agriculture and Fisheries, Memorandum. Agricultural Returns of England and Wales,* 1913, 2 pp London, October 20, 1913

The total acreage under crops and grass in England and Wales in 1913 was 27 129 382 acres, that is 45 308 acres less than in the preceding year. The arable land, the extent of which was 11 058 233 acres, diminished by 277 043 acres, whilst the area of permanent grass and pastures increased by 231 735 acres and amounts now to 16 071 149 acres The area under wheat was 161 776 acres less than in 1912, oats also occupied an area smaller by 97 779 acres. On the other hand the acreage devoted to barley has increased by 102 328 acres. Most other field crops show a diminished acreage, with the exception of lucerne and sugar beets which score slight increases. Potatoes occupy 20 868 acres less than in 1912 and mangolds 66 081 less, while the acreage of bare fallow rose from 273 725 to 387 832 acres. The extent of land under clover and grass in rotation diminished by 27 181 acres, but the acreage of these crops destined for conversion into hay increased by 145 572 acres.

1370 - **Technical and Economic Investigations on the Rearrangement of Properties in Bavaria.** — WEISS, A. in *Landwirtschaftliches Jahrbuch für Bayern*, Year 3, No. 9, pp. 381-384. Munich. 1913.

The writer has attempted, by means of an enquiry in the course of which he heard 125 farmers and people interested in agriculture who had taken part in the rearrangement of properties, to ascertain to what extent the rearrangement of properties made in conformity with the Bavarian law of May 29, 1886, on the subject, had answered to the technical requirements of agriculture, and what influence it had had upon farming in the rearranged districts.

In order to control the results obtained from the enquiry, he started further observations on the economical development of rearranged and not rearranged communes of the administrative district of Neu-Ulm, all of which are in about the same conditions as to their natural factors of production, which are those of normal Bavarian agriculture.

He begins by a short review of the history and of the expenses (average 30*s* per acre) of the rearrangement of properties in Bavaria, and proceeds to a discussion of the material collected from the enquiry and by his personal observation, giving the data in tables annexed to the paper, and arriving at the following conclusions:

In the whole territory investigated the average number of fields possessed by each person affected by the work was 9.9 before the rearrangement, and 4.6 after; the total number of fields is thus diminished by 53.5 per cent. The average extent of the fields was 0.84 acre before the rearrangement and 1.84 acre after it.

The fact that the extent of productive area of the majority of the farms ranges from 12 ½ to 50 acres diminishes somewhat the possible degree of rounding up. However, within the limits of the same kind of soil and of farming, and without prejudice to the greatest possible consideration for the economic position of the farmer in question, every effort must be made, on principle, towards complete rounding up. In general the question of the future economic possibilities gives the measure for the degree of rounding up to be attained.

A long period intervening between the notice of the operation and the delivery of the new fields is very disadvantageous for the individuals concerned and for the whole community, and is therefore to be avoided as much as possible. The rearrangement by stages and field by field is also to be condemned, since it often causes the chief advantages, such as the termination of the whole network of ditches and roads and complete rounding up, to be lost.

The want of rearrangement is not felt in all the territories comprised in the enquiry; nevertheless this idea has taken such deep root in some districts, especially in Swabia, that a solution of this problem should be generally facilitated by means of an alteration in the law.

To the question whether the agricultural and technical works should be carried out before or after the valuation of the territory to be rearranged, the answer is that the simultaneous drawing up of the plans for the network of drains and roads almost always renders a freer and more complete solution of the whole work of agricultural improvements possible, by adapting the road and drainage works to a systematic rearrangement of the land.

The writer then turns to the economic aspect of the question and treats first of the use of agricultural machines as influenced by the rearrangement. He shows that an increased, and especially a more profitable, use of machines (chiefly mowers and drills) is made in rearranged districts as compared with unarranged ones. In several localities, though, no increase of the number of machines has been observed, because the saving of time caused by the rounding up of the farms, especially in the medium-sized ones, has kept back the purchase of machines. It is questionable whether the rearrangement will have an influence on the formation of cooperative associations for the purchase of machines ; while it is possible that the practice of employing contractors possessing machines to mow and to perform some other farm work may extend.

One very favourable effect of the rearrangement upon the tilling of the soil is due to the timely draining of the surface water, the better shape of the fields and the suitable construction of the roads. The manuring also, and the further care of the crops, were, according to the opinion of 96 per cent. of the persons interested, considerably assisted and especially the more outlying or formerly almost inaccessible localities were benefited by the roads, being as if brought nearer, and by the complete manuring thus rendered possible they had become more productive.

As for the influence of the rearrangement upon the utilization of the soil, it is certain that rearrangement in Bavaria has favoured the transition to a better system of farming, but it cannot be said that it has led everywhere to more productive farming, for the rearrangement of whole communes has not been general ; further, the abolition of the old delimitations of the three fields in the improved three-year rotation has not been carried out everywhere.

In every 15 out of 100 communes a better rotation was introduced; the cases in which individual farmers adopted a better rotation after the rearrangement are much more numerous. Only a very far-reaching rounding up, without consideration of the three-field system, can — economic conditions permitting — render more general the adoption of better farming (with rotation of crops or without it).

The question whether fruit growing has really been stimulated by the rearrangements is answered in the affirmative by 44 per cent. of the observers. The plots allotted in the neighbourhood of the farmers' houses or of the villages were in 44 per cent. of the cases planted with fruit trees, while fruit growing in the open field has been only slightly extended (17 per cent. of the observations).

As for the effect of rearrangement upon gross production, it appears that the gross produce has risen on an average about 14 per cent. The special investigation on the harvests in the district of Neu-Ulm has shown that in the rearranged communes during the last 25 years the gross yields have had an average increase of 35 per cent., while those that were not rearranged had an increase of only 17.5 per cent. It must be noted that this result was obtained in the rearranged communes notwithstanding a more moderate use of artificials on an inferior soil.

The rearrangement was not able to cause any marked influence on the increase of numbers of productive live stock, but contributed to render stock breeding steadier, owing to the surer supply of fodder in general and that from the arable land in particular.

As a further result of the rearrangement it is to be mentioned that the cost of production of crops became less, in consequence of the relative saving of 9 per cent. of human and animal labour and of 6 per cent. of the wear and tear of machines and implements. The increase of intensity in farming did not of course allow of any absolute saving of human and animal labour becoming noticeable.

The increase in the value of land due to the rearrangement amounts to 17.7 per cent., and the increase of rents to 29 per cent. A calculation made in the district of Neu-Ulm by comparing the rents paid in the rearranged and in the other communes, showed that the profits in the former amounted to 25 per cent. of the capital invested.

Lastly, the writer points out the social effects of rearrangement in its bearing upon the conditions of credit, on litigation about land or water questions, on the greater attachment to the land, on the reawakening of public spirit, etc.

1377 – **The Distribution of the Land, and Agricultural Progress.** — DE MONICAULT DE VILLARDEAU, PIERRE in *Annales de la Science Agronomique*, Year 30, No 3, pp. 265-282. Paris, September 1913.

Practical agriculture has not achieved anything like the success that the considerable progress in applied sciences would lead people to expect. The writer shows that not even the industrialization of agriculture, which cannot be completely carried out on account of the special conditions of agricultural labour and capital, can show this success. Only a new division of the soil better adapted to the needs of farming can render new and important progress possible. According to the special object of the farm, and to the soil and labour conditions, the extent of the farms should be increased or diminished. The writer then shows how this could be done (by renting and subrenting, by cooperative farming) and how by these means many difficult problems, as for instance, that of labour and of capital, could be more easily solved, and further how other difficulties therewith connected could be overcome without leading to a far-reaching change of existing conditions.

1378 – **Cost of Work in Farming.** — GIAGNONI, C. N. in *Agronomia*, Year 4, No 10, pp. 273-286. Buenos Aires, August 1913.

This paper treats of the effect of the division of labour on the cost of labour, the cost of the day's work of men, draught animals and machines for certains agricultural operations, the cost of work performed by men, animals and machines together or the "complex day's work" (jornal compuesto), comparative cost of a given work performed by men, animals or machines.

1379 – **Farming on the Share System in the Bourbonnais, France.** — VILLATTE DES PRUGNES, R. Le contrat de metayage. — *La vie agricole et rurale*, Year 2, No 43, pp. 428-430. Paris, September 27, 1913.

The conditions of the share system agreement which settles the rights and duties of landowners and their farmers in the old French province of Bourbon are the following:

The landowner gives the land, dwelling house and farm buildings, the capital for the purchase of certain articles required on the farm, a portion (from a third to one-half) of the live stock; he gives the farmer, free of charge, all the straw and the hay from natural meadows and one-half of the hay from leys, he bears the whole expense of new buildings and land improvements, as well as of the upkeep of buildings, and one-half the monies spent on market dues, castration, weighing and shoeing of the live stock; he pays all the the taxes, the hire of the threshing machines and one-half of the necessary fuel. Further, he lets the farmer keep all the wood obtained from the trimming of hedges and the pruning of trees.

The farmer on his part gives all the labour required for working the farm; he supplies the machines and implements, he performs all the compulsory work imposed on the farm by the commune and does the carting of materials required for repairs to the buildings on the farm. On entering the farm the farmer pays the landowner one-half the total value of the live stock existing on the farm after deduction of the share mentioned previously; he pays, besides, a yearly sum called farm tax (impôt colonique) which amounts usually to 1*s* 3*d* to 2*s* per acre, and which varies according to the quality of the land, the state of the buildings and the share of the live stock borne by the landowner.

The produce of the farm is halved between landowner and farmer, with the following limitations: all the produce of a garden, which is always placed at the disposal of the farmer, belongs to him; as well as all the barley crop and all the potatoes minus 30 or 40 bushels. All the service fees, the tips usual in the country on the sale of live stock, the proceeds of poultry keeping (ducks, geese and turkeys excepted) as well as from the sale of milk and milk products belong to the farmer. When a farmer enters or leaves a farm, a valuer draws up an inventory; if at the end of the lease there is a surplus, as is almost always the case, the farmer gets one-half of it.

1380 - **Measures for Increasing the Economic Success of a Farm in the Department of Gard, France.** — VIGNER, R. Comment exploiter un domaine agricole dans le Gard? Consultation, in *La vie agricole et rurale*, Year 2, No. 42, pp. 416-423. Paris, September 20, 1913.

This is a description of the farm, 208 acres in extent, and of the previous system of farming. The measures to ensure success are: improvement of the soil and care of meadows and pastures, observance of a systematic rotation on the arable land, suited to the soil, climate and trend of farming, proper attention to the vineyard and to the oak plantation intended for the cultivation of truffles, introduction of the breeding and keeping of numerous head of productive cattle and sheep of the most suitable breeds.

1381 - **The Estate " La Rugginosa " in the Tuscan Maremma: Example of Intense Improvement.** — DAPPLES, CARLO in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 80, pp. 958-960. Berlin, October 4, 1913.

The writer describes the development of an estate of 1174 acres from 1906 to 1911 and indicates the methods adopted : improvement of the water conditions, systematic manuring, introduction of a regular rotation, division of the estate into farms. The maximum wheat crop in 1906 was 12 bushels per acre, while in 1910 it reached 31.8 bu. The average hay crop rose from 4.2 cwt. to 23.4 cwt. per acre. The total extent of pastures was 791 acres in 1906 ; in 1911 they were reduced to 52 acres, but there were 278 acres of grass leys. In the winter of 1906-07 the rent paid for grazing was 4*s* 4*d* per acre, while in 1910-11 it was 10*s* 10*d*. In 1906 the live stock on the estate were 25 oxen and cows, 6 calves and 17 horses ; while in 1911 there were 69 oxen and cows, 32 calves, 4 horses and 35 pigs.

1382 - **Continuous Wheat.** — BERNARD, PAUL. Bles sur bles. — *Le Progrés agricole*, Year 27, Nos. 1367 and 1368, pp. 688 and 706-707. Amiens, September 28 and October 5, 1913.

The writer is of the opinion that the continuation of the favourable conditions of the wheat market and the increasing difficulties regarding agricultural labour are the two principal causes of the ever growing importance of the cultivation of wheat, and that at the same time they warrant investigation of the practical possibility of continuous wheat growing. He then gives three instances, from which it appears that under certain conditions the continuous cultivation of wheat or other cereals is not only practically possible, but also advisable from an economic point of view.

1. On the estate Arcy-en-Brie in France (Seine-et-Marne), cereals have for many years followed cereals, namely always wheat for two years in succession and then oats. The resulting crops during the ten years from 1890 to 1900 gave an average of 33.3 bushels (60 lbs.) of wheat per acre and 50.1 bushels (42 lbs.) of oats per acre. The average gross returns per acre were £8 16*s* per annum, so that after deducting £2 2*s* 3*d* for manures there remains £6 13*s* 9*d* for wages, rent and profit.

2. — The English experiment station at Rothamsted has, since 1843, grown wheat year after year on the same field in order to determine the influence of certain manures upon the yield. The crop on the plots which has received no manure since 1843 was 12.2 bushels per acre in 1908 (the

average of the 65 years being 13.0 bu.), while the farmyard manure plot yielded 39.7 bushels (the average for the 65 years being 35.7 bu.).

3. — On the Blount estate in England cereals have been continuously grown since 1865, with the following results: the average crop of the last 25 years was 35.6 bushels of wheat and 39.5 bu. of barley. Between 1900 and 1904 the gross returns per acre of wheat were £7 18*s*, which, after deducting £6 9*s* 6*d* for expenses, left £1 8*s* 6*d* for net profit.

1383 – **The Cultivation of Tea in Small Holdings.** — REINJUST, A. E. in *Mededeelingen van het proefstation voor thee*, No XXIV, pp 2-8. Buitenzorg, 1913.

The writer gives an account of the expenses of planting and managing small tea plantations of 25 and 50 bouws (44 and 88 acres) in area, similar to those being developed in India and Ceylon. The figures given are approximations and do not include interest on capital expended (See tables below. One florin = 1*s* 8*d* or $ 0.40).

A plantation of 50 bouws is large enough to run its own factory, with an outlay of about 30 000 florins, but for a plantation of half the size it would not be economical.

Plantation of 50 *bouws.*

	Years					
	1st	2nd	3rd	4th	5th	6th
Expenses:						
Clearing	12 500	—	—	—	—	—
Seed	5 000	—	—	—	—	—
Nursery	200	100	—	—	—	—
Upkeep of plantation	—	3 000	3 000	3 000	3 000	3 000
Manure	—	—	—	1 250	1 250	1 250
Manager's bungalow	500	3 000	—	—	—	—
Coolie lines	500	500	—	—	—	—
Buildings	1 000	—	—	—	—	—
Repairs to buildings	—	100	200	250	250	250
Roads and water	500	500	500	100	100	100
Administration	3 600	3 600	3 600	3 600	3 600	3 600
Labour	600	600	600	600	600	600
General Expenses	2 000	2 000	2 000	2 000	2 000	2 000
Overseer's salary	1 200	1 200	1 200	1 200	1 200	1 200
Sundry	400	400	900	—	—	—
Total	28 000	15 000	12 000	12 000	12 000	12 000
Receipts	0	0	1 250	6 250	15 000	25 000

Plantation of 25 *bouws.*

	Years					
	1st	2nd	3rd	4th	5th	6th
Expenses :						
Clearing	6 250	—	—	—	—	—
Seed	2 500	—	—	—	—	—
Nursery	100	50	—	—	—	—
Upkeep of plantation	—	1 500	1 500	1 500	1 500	1 500
Manure	—	—	—	625	625	625
Manager's bungalow	500	3 000	—	—	—	—
Coolie lines	200	300	—	—	—	—
Buildings	500	—	—	—	—	—
Repairs to buildings	—	100	150	175	175	175
Roads and water	500	500	500	100	100	100
Administration	3 000	3 000	3 000	3 000	3 000	3 000
Labour	300	300	300	300	300	300
General Expenses	1 200	1 200	1 200	1 200	1 200	1 200
Sundry	50	50	50	—	—	—
Total . . .	15 100	10 000	6 700	6 900	6 900	6 900
Receipts	0	0	625	3 125	7 500	12 500

1384 - **Proportion of Area Occupied by the Various Crops and Net Profit.** - OSTERMAYER, A. Pflanzenbau und Reinertag. — *Zentralblatt für Landwirtschaft*, Year 93, No. 18, pp. 205-208. Brünn, September 16, 1913.

The solution of the problem of bringing the land to the highest degree of profitableness is in the first place dependent upon a suitable arrangement of the farm. The writer attempts to prove the truth of this statement by showing the reciprocal connection between the most important crops, the rotation followed and the manure used, and their effect on the profitableness of the farm, availing himself of the observations made on the books of 79 Moravian peasant farms, the average extent of which was 73.66 acres.

On grouping the farms according to the *area* of meadows and pastures, no law seems to be obeyed by the net profits in their oscillations. This is easily explained by the fact that the favourable action of the meadows on the crops of the arable land is due only to the transformation effected by the live stock of the fodder produced by the meadows into farmyard manure. and consequently it is not the *area* alone of the meadows that is intimately connected with the crops of the arable land, but also and to a great extent the *nature* of the meadows and the amount of their yield. If the farms be grouped according to this point of view it appears clearly that the existence of good meadows is capable of considerably increasing the crops:

Group	Hay crop per acre: lbs.	Net profit per acre	Wheat crop in lbs. per acre	Hoed crops in lbs. per acre
		£ s d		
I	3 529	2 11 9	1 633	16 565
II	2 375	2 5 3	1 470	16 479
III	1 706	1 19 6	1 403	14 131

The writer then divides the farms into three groups according to the proportion in which the land devoted to the production of fodder stands to the arable area, and at the same time according to the kind of fodder grown. Group I includes 26 farms which have developed their present rotation, mostly a six-year one, from the old three-year rotation, and consequently sow to clover at most one-sixth of the arable area. Group II comprises those farms which devote one sixth to one-quarter of their land to clover; these are eight farms following the Norfolk rotation and eight with a five-year rotation. Group III includes all those farms in which the rotation allows of more than a quarter of the area being devoted to forage crops. The greater extension of forage, which can only be obtained by leaving down the leys for two or three years, is found in 27 of the farms.

Group	Kind of fodder	Proportion of fodder in arable area	Net profit per acre
			£ s d
I.	Clover	up to $^1/_6$	2 10 3
II	Clover	$^1/_6$ — $^1/_4$	2 11 6
III	Clover and grass leys	more than $^1/_4$	2 2 9

The farms which grow clover by itself prove more profitable than those which include grasses in the ley, and the profit in the former is greatest where the greater extent is given to the nitrogen-fixing clover.

With increasing intensity of cereal production, as is shown by the observations, there is an increase in the value of the soil, of the stock and of the total value of the farm, as well as in the income from the sale of the crops; the outlay on labour increases also, so that the extension of cereal cultivation is equivalent to a general intensifying of the farm, but not to the extent of affecting its profitableness. This is clearly shown by the following table, in which the work of the owner is valued at £3 2*s* 6*d* per month, and the rate of interest of the whole capital invested in the farm is placed opposite to the most important figures showing the ratio of the areas occupied by the various crops to each other.

Group	Net profit per acre	Interest on capital invested	Ratio of area of crops				Cereals	Forage	Cereals and forage in percentage of acreage	Area of meadows and leys percentage of acreage
			Cereals	Hoed crops	Forage	Various	In percentage of acreage devoted to cereals and forage			
			in percentage of acreage							
	£ s d									
I	2 9 11	2.0	67.2	14.1	15.2	3.5	81.5	18.5	82.4	24.6
II	3 2 9	4.1	61.4	16.2	20.3	2.1	75.1	24.9	81.7	32.0
III	2 2 6	2.5	57.4	14.9	21.7	6.0	72.5	27.5	79.1	32.4
IV	2 3 6	0.3	52.1	12.9	27.7	7.3	65.2	34.8	79.8	37.3
V	2 8 6	2.3	45.7	13.2	28.6	12.5	61.5	38.5	74.3	33.6

The extension of cereals thus takes place at the expense of the area occupied by forage plants, which is not without importance for the provision of nitrogen for the cereals. Of great interest is the second fact, namely that the rate of interest on the capital varies directly with the extent of the area devoted to hoed crops.

1385 - **Limits of Profitableness of Farm Expenses in the Peasant Farms of Moravia.** — OSTERMAYER, ADOLF in *Zentralblatt für Landwirtschaft*, Year 93, No. 20, pp. 229-233. Brünn, October 16, 1913.

The writer investigates to what extent intensifying the amount of capital and of labour influence the economic success of Moravian peasant farms. With this object in view, he divides the peasant farms into groups by a system of points according to the amount of capital and labour employed on them, and then observes the net returns and the rates of interest of the capital invested in the property.

In this way he investigates first the effect of the intensification of the amount of capital invested in live and dead stock (see Table A) and finds that with the increasing amount of this capital, not only do the net returns per acre increase, but also the rate of interest of the whole capital: thus from — 5.2 in Group I to + 3.9 per cent. in Group VI. Group VII, on the contrary, shows a falling off in both signs of profit, which signifies that under the conditions of production obtaining in these Moravian farms the maximum of profit is reached by the farms of the sixth group with an index of intensity of 11 to 12 points.

Similar results are obtained by examining the degree of intensity of the circulating capital (Table B). The limit is reached here by Group III, with a net income of £3 1*s* 8*d* per acre and an interest on capital of 3.6 per cent. The grouping of the farms according to the whole working capital, as is shown by Table C, reveals that the highest returns per acre and the highest rate of interest are reached by Groups II and III; beyond this a falling off in both takes place. It follows that the net returns increase with the increase of the working capital up to £3 1*s* to £3 5*s* 9*d* per acre and to an interest of 3 to 3.9 per cent. on the total capital; beyond this limit, and always allowing the farmer £3 2*s* 6*d* a month in return for his work, an investment of more capital in the farm is not advantageous, because the greater returns it causes do not bring in the rate of interest usual in the locality.

Table D shows the effect of increasing the amount of human and team labour. It shows first that the net returns increase with the intensity of labour. A closer examination proves that the work of the farmer and his family contributes an ever increasing share to the increasing net returns. The rate of interest, however, does not run parallel with the net returns, but reaches its maximum with a medium intensity of work at four points in Group II, beyond which it sinks considerably. From this the writer draws the conclusion that in rendering farming more intensive, capital must be considered as the dominant factor and that the greatest foresight is necessary in increasing the intensity of the labour factor.

From the figures of Table E, which contains a grouping of the farms, it is seen that the economic importance of these principles is not yet sufficiently recognized. The farms with increasing total intensity show increasing net returns up to Group VIII, but the figures showing the rate of interest do not follow a parallel course. The ascending tendency connected with greater intensity is so frequently and so deeply perturbed that it does not appear any more to follow a law; and in no case does the rate of interest reach the 3 to 3.9 per cent. which was observed in considering the degree of intensity of the capital or of the labour employed. For the increase of intensity to give good economic results "each of the outlays on labour and capital must be increased in the most suitable ration of effectiveness towards each other" (Aereboe).

The limit of the increase of intensity of a farm depends further to a great extent upon the economic and natural conditions of production prevailing at the time. The terms *intensive* and *extensive* must not be taken in the sense of an *absolutely* higher or lower outlay of capital and labour per acre of land, but in the sense of a relatively high outlay in relation to given economic and natural conditions.

This is proved by Table F, in which the influence of the natural and economic situation as well as the size of the farm upon the profitableness of intensifying is shown. The net returns here increase, in the most favourable natural situation (Group I), with the increase of intensity. This holds good for Group II also. In the less favourably situated Group III an increase of cultural intensity to the extent which is still advantageous in a better natural situation, is here no longer economically justifiable.

Group of farms	Degree of intensity points	Total value of farm: crowns per hectare	Work done by farmer man-months per ha.	Net returns: crowns per ha.	Value of farmer's work: crowns per ha.	Interest on capital	
						crowns per ha.	per cent.
A. — *Intensification of capital in live and dead stock*							
I	up to 6	1 173	1.73	68	130	— 62	— 5.2
II	7	1 446	1.54	131	116	+ 15	+ 1.0
III	8	1 959	1.13	142	85	+ 57	+ 2.9
IV	9	1 977	1.20	147	90	+ 57	+ 2,8
V	10	2 448	1 55	186	116	+ 70	+ 2.8
VI	11–12	2 651	1.21	195	91	+ 104	+ 3.9
VII	13–16	3 907	1.63	165	122	+ 43	+ 1.1
B. — *Intensification of circulating working capital*							
I	1	1 387	1.62	95	122	— 27	— 1.9
II	2	1 836	1.45	136	109	+ 27	+ 1.4
III	3	2 457	1.25	183	94	+ 89	+ 3.6
IV	4	3 311	0.99	160	74	+ 86	+ 2.5
C. — *Intensification of the total working capital.*							
I	over 14	3 507	1.16	109	87	+ 22	+ 0.6
II	13–14	2 565	1.54	181	118	+ 63	+ 2.4
III	11–12	2 094	1.17	152	88	+ 64	+ 3.0
IV	9–10	1 730	1.78	129	134	— 5	— 0.2
V	under 9	1 240	1.45	92	109	— 17	— 1.3
D. — *Intensification of labour.*							
I	up to 3	1 521	0.41	80	31	+ 49	+ 3.2
II	4	1 658	1.00	134	75	+ 59	+ 3.5
III	5	2 038	1.59	158	119	+ 39	+ 1.9
IV	6	2 382	1.76	144	131	+ 13	+ 0.5
V	7-8	3 224	2.40	207	180	+ 27	+ 0.8
E. — *General intensity.*							
I	up to 12	1 368	1.33	87	100	— 13	— 0.9
II	13	1 200	1.08	111	81	+ 30	+ 2.5
III	14	1 328	1.10	119	83	+ 36	+ 2.7
IV	15	2 128	1.15	126	86	+ 40	+ 1.9
V	16	2 101	1.31	147	98	+ 49	+ 2.3
VI	17	2 135	1.70	160	128	+ 32	+ 1.4
VII	18-19	2 387	1.70	167	128	+ 39	+ 1.6
VIII	20-22	3 051	1.86	218	140	+ 78	+ 2.5
XI	over 22	3 849	1.45	182	109	+ 73	+ 1.8

F. — *Influence of natural and economic position upon the admissible limit of intensiveness.*

Criterion of grouping	Group	Degree of intensity up to 14 points			Degree of intensity 15 to 17 points			Degree of intensity over 17 points		
		Total value of farm: crowns per ha.	Farmer's work: man-months per ha.	Net returns: crowns per ha.	Total value of farm: crowns per ha.	Farmer's work: man-months per ha.	Net returns: crowns per ha.	Total value of farm: crowns per ha.	Farmer's work: man-months per ha.	Net returns: crowns per ha.
Natural position	I	—	—	—	2 471	0.85	185	3 188	1.27	203
	II	1 374	1.08	95	2 153	1.52	123	2 704	1.73	197
	III	1 179	1.40	117	1 645	1.40	190	1 872	2.90	152
Economic position	IV	1 432	2.10	124	1 891	1.26	65	—	—	—
	III	1 333	1.09	83	1 713	2.60	168	3 319	2.25	137
	II	1 257	1.18	93	2 296	1.03	161	2 897	1.57	205
	I	1 206	0.70	102	2 012	0.85	158	2 879	1.55	214
Size	I	1 294	0.36	79	1 942	0.05	99	—	—	—
	II	1 373	0.70	112	3 497	0.60	182	2 095	0.30	179
	III	1 270	0.88	99	2 346	1.15	123	3 327	0.60	140
	IV	1 435	1.83	137	2 109	1.21	186	2 937	1.24	229
	V	1 379	2.57	72	1 867	2.63	157	2 762	3.33	167

G. —*Intensification from the point of view of public economy.*

Degree	Capital in live and dead stock		Circulating capital		Labour		Total circulation	
	Points	Gain to public economy	Points	Gain to public economy	Points	Gain to public economy	Points	Gain to public economy
I	up to 6	102	1	129	up to 3	135	up to 12	126
II	7	180	2	212	4	206	13	165
III	8	221	3	276	5	219	14	181
IV	9	228	4	296	6	238	15	195
V	10	287	—	—	7-8	329	16	213
VI	11-12	290	—	—	—	—	17	263
VII	13-14	311	—	—	—	—	18-19	270
VIII	—	—	—	—	—	—	20-22	328
IX	—	—	—	—	—	—	over 22	343

The same is the case in the relations between degree of intensity and economic situation. Group III, consisting of farms already less favourably situated as regards economic position, shows that an increase of intensity is profitable only as far the second degree of intensity, and in Group IV extensive farming is the most profitable.

In investigating the effect of the size of the farm, it appears that the smaller the extent of the farm, the later are the limits of the advantages of intensifying reached. It thus follows that the greater intensity given to a farm is a means of increasing the net returns only within the limits set by its natural and economic situation.

From the point of view of the economic production of the country, the question has to be judged differently, inasmuch as there the increase of intensity is always connected with an increase of income, as is shown by Table G. Nevertheless, the interests of private and public economy go hand in hand, because more intensive farming is all the more capable of increasing net returns the better are the natural and economic conditions.

Thus when the whole country improves the economic conditions of agricultural production by facilitating and promoting agricultural improvements, etc., it makes a more intensive farming possible or facilitates it and thus renders itself the greatest service.

One crown = 10*d* or 20.3 c.; one hectare = 2.47 acre; 100 crowns per ha. = £1 13*s* 9*d* or $ 8.21 per acre.

1386 – **Cost of Milk Production in Mexico.** — BONANSER, SYLVIO in *Gaceta de Agricultura y Veterinaria*, Year 4, No. 7, pp. 1-3. Mexico, July 1, 1913.

The writer wishes to demonstrate that the sale of pure whole milk in Mexico at the price of 13.4 *d* per gallon leaves no margin of profit, for the average cost of production of one gallon of milk is 13.1 *d*.

This cost is calculated as follows :

	£	s	*d*
Amortisation of the value of a cow, considering the average purchase price at £ 35 17 *s* 6 *d*, the average sale price at £ 5 2*s* 6*d* and the average period of milk yield at 5 years.	6	3	0
Interest on the capital invested in the cow	2	3	0
Cost of feeding, 1*s* per day	18	9	0
Attendance, surveillance, taxes, implements, lighting, etc., 10*s* 3*d* per month	6	3	0
Veterinary surgeon and medicines, 2*s* per month	1	4	7
Rent of buildings, 2*s* per month	1	4	7
Total . . . £	35	7	2
Deduct the value of the calf		10	4
Cost of production of milk per cow per year . . . £	34	16	10

With a production of 2900 litres (638 gallons) of milk per year, the cost per gallon is 13.1 *d*.

AGRICULTURAL INDUSTRIES.

DAIRYING.

1387 - **The Actual State of the Dairy Industry in Japan.** — *Communicated by* DR. W. YAMASHITA, *Agriculturist to the Central Agricultural Experiment Station of the Empire.*

The diet of the Japanese people consists largely of vegetable food, the most important part of which is rice. When animal food is used it consists principally of fish. In ancient times, cattle were very commonly slaughtered both for food and as sacrifice. On the introduction of Buddhism in the middle of the sixth century, the custom of eating animal food gradually died out, as it was considered a crime to take life. Cow's milk as food was already known 1200 years ago, but it was rarely used and only by the higher classes. Cattle were generally reared only as beasts of burden and for tillage, until the restoration.

Since then the Government has laid great stress on the improvement of cattle by the importation of foreign breeds, in particular Ayrshires, Holsteins and Brown Swiss, and now cross-breds are steadily increasing throughout the country. The breeding of pure foreign cattle is also engaged in, and these too steadily increase in number. The following table gives the number of foreign pure-breds kept for breeding purposes (dairy-cattle) in 1909 :

	Cows	Bulls	Total
Ayrshires	1683	783	2466
Holsteins	1907	783	2690
Jerseys	100	37	137
Brown-Swiss	156	180	336
Simmenthalers	27	38	65
Guernseys	5	—	5
French Canadians	9	4	13
Total	3887	1825	5712

As the above shows, the Ayrshires and Holsteins predominate ; consequently the greater number of cross-breds in Japan have the blood of these two in them. The total number of cows at present kept in Japan is about 900 000. Of this number 50 000 are milch-cows fed exclusively for the dairy. The annual yield of milk from the dairies is about 10 000 000 gallons, corresponding approximately to 0.8 quart per head of population. In addition to this the farmers to some extent use milk from cows which are not kept really for milking purposes; still, the total is very small when compared with the quantities consumed in European countries.

However, the consumption of milk is increasing in Japan, and the deficiency of supply is made good by the importation of foreign dairy products. The following table shows the quantities of condensed milk imported and that produced at home since 1904.

	Condensed Milk imported — lbs.	Condensed Milk produced in the country — lbs.	Total — lbs.
1904	6 021 684	288 041	6 309 725
1905	8 324 012	272 348	8 596 360
1906	7 469 292	293 349	7 762 641
1907	10 017 172	288 284	10 305 456
1908	10 909 920	320 096	11 230 016
1909	10 610 592	—	—
1910	10 792 586	834 387	11 626 973
1911	9 125 064	1 200 046	10 325 110

Condensed milk is imported into Japan from England, Germany, Switzerland, Austria-Hungary, Norway, the United States of America, Canada, etc.

Dairies in Japan are usually in the neighbourhood of cities or towns and seldom keep a large number of cows. Immediately after milking the milk is filled into small bottles. In these it is sterilized at above 80° C. in a small sterilizer heated by steam, and this milk is distributed to the consumers early every morning.

The condensed milk is prepared from milk supplied by farmers in factories owned by co-operative associations; in these the vacuum pan is made use of. The factories are as yet few in number; they are, however, expected to increase gradually.

The demand for butter is growing; the appended table gives the quantities imported and produced in Japan since 1906.

	Butter imported — lbs.	Butter produced — lbs.	Total — lbs.
1906	157 113	55 236	212 349
1907	155 968	45 148	201 116
1908	129 597	—	—
1909	125 546	153 410	278 956
1910	129 874	230 639	360 513

Butter is imported from England, Germany, France, Belgium, Italy Austria-Hungary, Holland, Russia, Denmark, the United States of America. Canada, Australia, etc. In Japan it is commonly made on a small scale by milk dealers, but within the last few years small creameries have been organized by farmers on the co-operative system. Here butter is made and the skimmed milk is used for feeding calves.

Oleomargarine is also imported from foreign countries, but the quantity is decreasing; the method employed in making oleomargarine in Japan is very primitive.

The demand for cheese is still very small. Since 1903 the quantities imported and produced in this country have been as follows:

	Cheese imported — lbs.	Cheese produced — lbs.	Total — lbs
1903 . . .	55 524	—	—
1904 . . .	56 764	—	—
1905	64 992	—	—
1906	55 081	—	—
1907	49 006	—	—
1908	45 262	—	—
1909	46 464	11 450	57 914
1910	44 884	15 181	60 065

Dairy farmers use common grass and rice straw for the feeding of dairy cows. This is due to difficulty of cultivating meadow grass profitably. Though sometimes corn-silage is used on the American system, the supply of coarse fodder has proved generally unsatisfactory. Of concentrated fodder, wheat-bran, rice-bran and *tofu* cake (*tofu* is vegetable casein made from soya-beans) are the most important. Lately, soya-bean cake, which is largely imported from Manchuria as manure for rice culture, is taking the place of wheat-bran as food for cattle.

Regarding the sanitation of dairies, two laws have been promulgated, the first to prevent the spreading of contagious diseases, the second to prevent the spread of tuberculosis in cattle. Cattle plague is kept in check in Japan by very rigorous measures. The inspection of tuberculous animals is made by the tuberculine-test and seriously diseases animals are slaughtered.

The sale of milk is regulated according to rules made by the Department of the Interior. The specific gravity, fat content, etc., are prescribed, and the sale of unwholesome milk from diseased animals is prohibited.

1386 – **Reindeer Milk and Reindeer Cheese.** — BARTHEL, CHR and BERGMAMN, M. ARVID in *Zeitschrift fur Untersuchung der Nahrungs- und Genussmittel sowie der Gebrauchsgegenstände*, Vol. 26, Part 5, pp. 238-241. Berlin, September 1, 1913.

Milk. — Reindeer milk when freshly drawn is of a thick, creamy consistency and possesses a pleasant smell and taste. On keeping, the fat becomes rancid, the smell pungent and the taste unpleasantly sour. The Lapps always dilute it with a third or a half of its volume of water before drinking it. Undiluted it is used as cream for coffee. Butter is seldom prepared from it, but more frequently cheese, or a kind of dense milk in which leaves of *Rumex, Archangelica* and sometimes also *Mulgedium* are mixed. In order to keep it, the milk is left to freeze or to acidify spontaneously.

The percentage composition of the milk according to several analyses made by the writer is the following:

Water —	Protein (1) —	Fat —	Milk sugar —	Ash —
63.30	10 30	22.46	2.50	1.44

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(1) Nitrogen × 6 37.

In the ash the following percentage was found :

K_2O	Na_2O	CaO	MgO	P_2O_5	SO_3	Cl
14.64	16.20	35.28	2.72	30.44	1.68	4.17

The diameter of the fat globules averages 5 μ, but ranges between 1 and 14 μ.

The figures given by the writer agree with those found by Fleischmann and Pandnitz, except for fat content, which the latter found about 5 per cent. lower.

Cheese.— Reindeer's milk cheese is a fat hard cheese curdled with rennet, which in the Lapland Marches of Västerbötten is made in round shapes about 2 inches high and weighing about 1 pound ; the top and bottom of the cheeses are flat, the sides are rounded off. The rind is thin and the texture of the cheese is compact but fissured. Round the fissures the mass is yellow ; the rest is white, but it turns yellow immediately it is cut.

The rind has a pungent taste ; the cheese itself has the fine aroma of reindeer milk and melts in the mouth. It may, however, become rancid ; it has then a strong smell and an acrid taste. The cheese is mostly used by the Lapps as an adjunct to their coffee.

On analysis the cheese showed the following percentage composition:

Water	Protein and derivatives	Fat	Other organic matter	Ash
28.31	22.57	44.02	2.20	2.40

The total nitrogen is divided into: soluble N, 43.46 per cent.; decomposition N, 12.24 per cent.; ammoniacal N, 1.58 per cent.

For the fat constants the following figures were found :

Köttstorfer's saponification value	226.1
Reichert-Meissl number	34.6
Polenské's number	1.1
Iodine value (according to Hübl)	23.3
Refractometer reading at 40°	41.4

The saponification value and refractometer reading agree with the same constants for cows' milk, while the Reichert-Meissl number is higher and Polenske's and the iodine values are lower.

1389 - **Lobeck's Biorisator Process** (1). — FREUND, W. in *Molkerei-Zeitung*, Year 27, No 77, pp. 1489-1491. Hildesheim, October 3, 1913.

The writer reports upon a trial of the milk sterilization process recommended by Lobeck carried out on behalf of the Association of the Large Milk Purveyors of German towns. In Germany hitherto two dairies have set up biorisators, one at Düsseldorf and the other at Leipzig. The Düsseldorf plant, which is erected on the dairy premises, can deal with 220 gallons per hour, while the biorisator placed in a shed adjoining the Leipzig dairy treats 55 gallons per hour. No tests were made as to the consumption of steam, but it appears to be low in both plants. The examination of the milk by the writer showed that in both dairies when the biorisator worked normally it did not cause any alteration in the milk as to appearance, colour, smell, taste or capacity of separating cream. The peroxydases also remain unchanged, though catalase and reductase suffer a slight reduction. Coagulation is somewhat delayed, but nowise impaired. The vegetative forms of bacteria, with the exception of individual specially resistant spores of earth and hay bacteria, are killed. All pathogenic germs are certainly destroyed by the biorisator. Biorised milk contains no albumen coagulum and possesses the same fat globules as raw milk. It is considerably superior to raw and pasteurized milk in its keeping qualities. The writer is convinced by the results of the test and by the impression received during the inspection of the installation that this process is really capable of accomplishing what is claimed for it.

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(1) See No. 743, *B.* June 1913 and No. 1190, *B.* Oct. 1913. (*Ed.*).

1390 - **Control of Butter Yield.** — Hesse, H. in *Molkerei-Zeitung*, Year 27, No. 68; pp. 1321-1322 Hildesheim, September 3, 1913.

The writer illustrates two formulae on the basis of which he has recently worked out nine tables for the calculation of the yield of butter from cream.

The formula for the calculation of the butter yielded by cream is the following:

Yield of butter $= \frac{a\,(b-c)}{d-c}$, in which:
a = the quantity of cream churned
b = the fat content of the cream
c = » » » » » buttermilk
d = » » » » » butter

1391 - **The Scientific Basis of Cheese Maknig and the Use of Artificial Rennet in the Manufacture of Emmental Cheese.** — Allemann, O. in *Landwirtschaftliches Jahrbuch der Schweiz*, Year 27, Part 5, pp. 325-361. Berne, 1913.

The writer reports upon careful experiments conducted at the Dairy and Bacteriological Institute at Liebefeld, near Berne, with the object of throwing more light upon the scientific basis of cheese making and especially upon the question of the advisability of using artificial rennet in the making of Emmental cheese. The nature of artificial and of natural rennet was studied, as well as the value of both rennets, by means of comparative experiments in cheese making (with and without starters); the questions of milk coagulation, the working up of the curd before and after cutting, the processes which take place in the curd under the press, the treatment of cheeses during ripening and the valuation of results were also dealt with.

As to the rennet to be used in the manufacture of Emmental cheese, it was found that the natural rennet made by the cheese makers and the rennet powder called artifical rennet do not differ much in their action. With the exception of the fact that natural rennet is somewhat richer in lactic acid bacteria, it is nowise superior to the artificial product. In order to avoid the many injurious bacteria which are often present in naturel rennet, it is advisable to treat it with acids, or with pure cultures of lactic acid bacteria. On the whole, however, it would be better if the Emmental cheese makers were to give up natural rennet altogether in favour of the commercial rennet powder, duly combined with cultures of lactic acid bacteria. Experiments in this direction carried out at the Liebefeld Institute during several months have shown that cheeses made with artificial rennet and pure cultures of lactic acid bacteria are not inferior to those made with natural rennet and pure cultures of lactic acid bacteria.

1392 - **Synthetic Milk Production from Soya Beans in Liverpool.** — *The Chemical World*, Vol. II, No. 10, pp. 332-333 London, October 1913.

VARIOUS

A factory for the making of synthetic milk from soya beans and other ingredients is shortly to be established in Liverpool. Soya beans contain 40 per cent. of " soluble casein " under conditions which admit of its ready utilization for the making of milk, which, as regards nutriment, is claimed to be equal to cow's milk, having a fat more easily assimilable than that of the latter. The company projecting to establish a factory in Liverpool is the " Synthetic Milk Syndicate, Ltd., " London, and they will work according to Dr. Fritz Gössel's process (of Stockheim, Essen, Germany). For the production of 100 litres of milk the procedure is as follows: about 10 kilos of finely ground soya beans (or earth or pistachio nuts, or sesame or teal seeds or mixtures of same) are mixed with about 100 litres of water and a small quantity (about 5 gms.) of phosphate of soda or potash or the like, allowed to stand about an hour, and then slowly brought to the boiling point and only just allowed to boil; the liquid is then suitably filtered and the residue pressed after it has been cooled to about 50° C. About 2.4 kilos. of milk sugar or other suitable carbohydrates, about 6 gms. of sodium chloride and 60 gms. of carbonate of soda are dissolved in the liquor run off, and about 2 kilos. of sesame oil or any other suitable mixture of fats or oils are mixed with the solution. The milky liquor obtained would be brought to the volume of 100 litres by the addition of pure water. The " milk " can be manufactured at a cost which will admit of its being sold to dealers at 2 *d* per quart.

PLANT DISEASES

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES

1393 - **Importation of Vines into Roumania.** — Extract from *Moniteur commercial roumain*, Oct. 1, 1913, in *Feuille d'informations du Ministère de l'Agriculture*, Year 18, No. 41, p. 1. Paris, October 21, 1913.

The Minister of Agriculture and of the crown-lands of Roumania has issued the following decree to take effect in the autumn of 1913: All American grafts and vines of every kind entering Roumania must be accompanied by a certificate of origin, independent of the importation permit granted by the Ministry. This certificate must indicate : *a)* the place of origin, the commune, district and nursery in which they were grown; *b)* the name of the nurseryman sending the stocks, and the name of the receiver; *c)* the name and nature of the stocks; *d)* the frontier town from which they are sent into Roumania.

The certificate of origin must be legalised by the communal authority in the place of production as conforming to the declaration contained therein.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN

1394 - **On the Pathological Significance of the Endocellular Fibres in the Tissues of the Vine** (1). — PETRI, L. in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Serie V, Vol. XXII, Second Half-year, Part 4, pp. 174-179 + fig Rome, 1913.

The author asserts that the characteristic symptoms of "bramble-leaf" are always preceded for a year or more by the formation of endocellular fibres. In vines on their own roots which become slowly diseased there exists what may be called an incubation period during which the plants appear healthy externally, but possess endocellular fibres in the tissues of the stem. In the nurseries of Sicily it is easy to find stocks with normal growth, yet containing numerous endocellular fibres. They can be distinguished from really healthy vines only by the later development of the buds and the more vigorous growth of the suckers.The latent pathological condition can be determined by grafting healthy shoots of *Vitis vinifera* onto them, or better still by propagating cuttings. The disease appears in the course of the first or second year in the cuttings or in the grafts.

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(1) See No. 1207, *B.* Oct. 1913. *(Ed.)*.

According to the writer, a vine with endocellular fibres in its young shoots does not necessarily become permanently attacked by the "bramble-leaf" disease. In previous works he has shown that healthy vines exposed to cold in spring may form endocellular fibres, with or without shortening of the internodes and perforation of the leaves, without being really diseased. In bearing vines, the damage is always confined to the one season, and if the new buds do not suffer from late colds in the following year, they develop normally. With vines grown for cuttings, however, the effect of late colds on the year's shoots is more serious, even if they show normal development. Cuttings obtained from such shoots, either in the nursery or planted out, show a low percentage of rooting. Those which do take root show the presence of endocellular fibres in the side roots, for this reason, grafts on these stocks also frequently develop the symptoms of " bramble-leaf ". Consequently the writer considers that vines showing the presence of these fibres are diseased, or at least show a latent pathological condition in the organs in which such cytological anomalies occur.

In order to remove any doubt as to the chance coincidence of the presence of these threads and " bramble-leaf " disease, the writer conducted experiments to determine what degree of disease could be attributed to the physiological disturbance of the active cambium cells, when, under the action of cold, they produce these fibres. In February 1913 he cut off at the base shoots of a vine which had been exposed to cold in the previous year and which showed the endocellular fibres, as well as control shoots; the two series of shoots were planted in pots and kept under the same conditions. The control shoots rooted and produced normal shoots, whilst the others did not develop roots and their buds soon withered. This does not prove that there is any genetic relation between the formation of fibres and " bramble-leaf ", but it shows that the shoots with the abnormal cell-contents are not healthy. Consequently in the reconstitution of vineyards, it is necessary to discard as far as possible those plants showing endocellular fibres in their wood.

The writer records that the repeated cold spells of the spring of 1913 caused a very serious outbreak of this abnormal cell condition even in the shoots at the base of the plants. It is not the position of the shoot which determines its resistance or otherwise to the effects of cold, but rather its particular stage of developemnt at the time.

The writer also confirms the fact that these fibres occur in the higher internodes only in vines that have been diseased for some time. The cambium in these internodes very rarely develops this abnormal condition, because such growth takes place when the period of spring colds is past; it is only when cold snaps occur very late that the cambium of the upper internodes can produce fibres. Such cases are naturally exceptional and are of no value in diagnosing the extent of the disease. It is different, however, with shoots of vines which have shown the formation of fibres for several years. In such shoots, fibres may develop in the internodes independently of the direct influence of cold. Consequently the development of fibres in the apical region of shoots has a pathological significance which is dependent on the presence of fibres in the woody tissues of the stem.

BACTERIAL AND FUNGOID DISEASES.

FUNGI

1395 - **Experiments on the Susceptibility of the Oak to Mildew.** — RIVERA, VINCENZO in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, Second Half-year, Part 4, pp 168–173. Rome, 1913

The writer has conducted experiments with seedlings of three varieties of *Quercus Robur* growing in culture media and in soil, in order to determine the influence of the age and turgidity of the leaf and the rate of root absorption and nutrition of the leaf on the susceptibility to mildew. Experiments have also been made on the infection of immune leaves.

As a result of these experiments it has been found that the full-grown leaves of the oak are resistant to the disease, while young leaves in an active state of growth are attacked, the degree of susceptibility being proportional to the rapidity of growth. This explains why the fresh shoots of pollarded trees, trunk shoots and suckers are so susceptible. Young growing leaves kept at even maximum turgescence in moist air do not get attacked, though conidia germinate on them very readily. Loss of turgidity due to high temperatures is an important factor determining infection. The concentration of the culture solution (Knop's solution) also influences the susceptibility of the leaf, because in pure water as well as in concentrated solutions, growth is arrested and immunity established.

Leaves completely etiolated are not susceptible, while those only partially etiolated are attacked in different degrees, those grown in a red light being less susceptible. Direct sunshine appears to hinder infection. Inorganic salts do not appear to exert any direct influence on susceptibility. In the experiments with resistant leaves, variations in turgidity were not successful in bringing about infection.

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS

1396 - **Diseases and Pests of Cereals in 1912.** — RIEHM, E. in *Centralblatt fur Bakteriologie, Parasitenkunde u. Infektionskrankheiten*, Part 2, Vol 39, No 4-7, pp. 81-107. Jena, 1913.

A review of the most important work published during 1912, comprising the following:

1) Diseases and non-parasitic disturbances.

2) Weeds and fungi (*Ustilagineae, Uredineae, Fusarium*, straw blight, other fungoid parasites).

3) Animal pests (insects, birds and mammals).

A list of 134 publications quoted in the text is appended.

1397 - ***Rhabdospora alexandrina* n. sp., parasitic on Berseem *(Trifolium alexandrinum)* in Algeria.** — CHRESTIAN, J. and MAIRE, R. in *La Revue de Phytopathologie appliquée*, Vol. I, No 9, pp. 125-129, figs. 1-6. Paris, October 5, 1913.

Trifolium alexandrium has been grown with success during the last three years at the School of Agriculture, Maison Carrée (Algiers). In December 1912, a disease, characterised by irregular black spots on the stems and round brownish spots scattered on the surface of the leaves, appeared and spread rapidly over an area of more than 2 acres. Fructifications of the fungus develop readily on the diseased patches on the stems, but rarely on the leaves. The writers consider this fungus to be a new species and describe it as *Rhabdospora alexandrina*, allied to *Septoria compta* Sacc. (which attacks the leaves of *Trifolium alpestre* and *T. incarnatum*) and differing from *R. Trifolii* Ellis. Pure cultures of the fungus have been obtained.

The damage of the infested plots due to this fungus amounts to more than half the crop. The rapid spread of the disease has apparently been favoured by the rather impermeable nature of the loamy soil and repeated mowing of the crop. Consequently the writers do not consider the disease liable to become an epidemic and endanger the cultivation of this clover.

As precautions against its spread, they recommend a suitable rotation and drainage of the soil. Spraying with copper sulphate after harvesting the crop has given decidedly beneficial results. The best means of limiting the damage would be to cut the crop early before it has been much injured.

1398 - ***Passalora Heveae* n. sp., a Leaf Disease of *Hevea brasiliensis* in British Guiana.** — BANCROFT, C. K. in *The Journal of the Board of Agricultural of British Guiana*, Vol. VII, No. 1, pp. 37-38. Demerara, July 1913.

The writer records a new leaf disease on Hevea observed recently amongst nursery trees. It is characterised by spots, increasing in size and forming dry areas, which ultimately become holes. The fungus causing the disease is said to be a new species, and is described as *Passalora Heveae* Massee.

It seems advisable to destroy all the affected leaves before planting out. Spraying with lime-sulphur is recommended for the nurseries, as it will also serve to destroy insects.

1399 - ***Oidium Agatidis* n. sp. and *Cercospora Agatidis* n. sp., Parasitic on *Agati grandiflora* (1), an Ornamental Leguminous Plant from Cochinchina.** — FOEX, E. in *Bulletin trimestriel de la Société mycologique de France*, Vol. XXIX, Part 3, pp. 348-352, figs. 1-3. Paris, 1913.

On leaves of *Agati grandiflora* from Cochinchina, the writer found irregular brown spots and minute black points. A water-colour drawing sent with the material shows that in the fresh state some of the leaflets show a white web-like covering suggesting the presence of a mildew. In sections, the writer has found an *Oidium* which he provisionally describes as *O. Agatidis*.

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(1) In the *Index Kewensis*, *Agati grandiflora* Desv. is referred to the genus *Sesbania*. (*Ed.*).

The black points are due to a new species of *Cercospora* which he calls *C. Agatidis*.

1400 - **Cucumber Leaf Spot *(Corynespora Mazei)* in Germany.** — ALTHEIMER in *Praktische Blätter für Pflanzenbau und Pflanzenschutz*, Year 9, pp. 109-112. Stuttgart, 1913.

Cucumber leaf-spot (caused by *Corynespora Mazei*), though well known in England since 1896 and in Holland (where it is called "bladwour") since 1905, was first recorded in Germany at Hamburg in 1909, since when it has reappeared sporadically. The writer found it recently on some cucumber leaves received from Swabia and the Palatinate. It was probably introduced into Germany in seed bought from England and perhaps also in the cucumbers which are imported from England in large quantities each spring.

The disease first appears on the leaves as small spots about the size of a pin's head, conspicuously scattered over the entire leaf; these spots grow rapidly, forming dry patches and in about 7 or 10 days the entire plant may be destroyed. It is probable that a slight weakening of the plant predisposes it to infection; the rapidity of the destruction may then be accounted for by the susceptibility of cucumber plants to conditions of temperature, ventilation soil and manure, and also by the rapidity of growth of the fungus.

Experiments on the disinfection of seed from the infected districts show that immersion for 24 hours in a 2 per cent. solution of copper sulphate does not interfere with their germination. The writer believes that a solution of corrosive sublimate may be useful.

The experiments (not yet completed) on the treatment of the disease by spraying various solutions, including copper-soda mixture, copper sulphate and other substances, afford no results of value.

The writer recommends a trial of basic slag and potash salts.

1401 - ***Asperisporium Caricae* and *Sphaerella Caricae* Parasitic on the Leaves of *Carica Papaya* in Brazil.** — MAUBLANC, ANDRÉ in *Bulletin trimestriel de la Société mycologique de France*, Vol XXIX, Part 3, pp 353-358, plate XXIX. Paris, 1913.

In the Rio de Janeiro district of Brazil, the leaves of the Papaw (*Carica Papaya*) are often attacked by a disease which appears on the upper surface as round or irregular spots 1 to 4 mm. in diameter, at first pale yellow surrounded by a broad brownish border and changing to a glistening white; on the underside of the leaf the patches quickly become covered with numerous brownish-black points, often arranged in concentric circles, and which ultimately cover the whole surface of the patch. Examination under the microscope shows that these black spots are the condial stage of a fungus known in other countries on the same host, and described successively as *Cercospora Caricae* Speg., *Scolecothricum Caricae* Ell. et Ev., *Epiclinium Cumminsii* Massee, *Pucciniopsis Caricae* Earle and *Fusicladium Caricae* (Speg.) Sacc; the writer considers it belongs to a new genus of Hyphomycetes, which he delimits under the name of *Asperisporium*, so that the fungus becomes *A. Caricae* (Speg.) Maubl.

The writer has also observed, on the upper surface of the older patches on the leaves, the formation of small black perithecia, which he considers to be the perfect form of *A. Caricae* and describes as new under the name of *Sphaerella Caricae*.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

1402 - ***Cuscuta arvensis* and its Hosts.** — D'Ippolito G in *Le Stazioni sperimentali agrarie italiane*, Vol. XLVI, Part 7-8, pp. 540-549. Modena, 1913.

The writer sowed seeds of *Cuscuta arvensis* Beyrick with clover in a pot; after a time he observed that the parasite had spread out of the pot and had attacked various weeds growing along a road adjoining for a distance of more than 20 yards; these weeds were *Rumex pratensis, R. crispus, Mercurialis annua, Sonchus oleraceus, Sinapis arvensis, Solanum nigrum, Urtica dioica, Cnicus arvensis, Lactuca Scariola, Polygonum aviculare, Setaria verticillata* and *Matricaria inodora* (1).

Subsequently the writer placed fragments of *Cuscuta* on the lower part of the stems of two poisonous plants, *Conium maculatum* and *Delphinium Staphisagria*. He found, the day following the infection, that the parasite had already firmly attached itself to its host, which together with the parasite continued to develop normally. In the stems of *Conium* and *Delphinium* it was found that some of the cells containing the alkaloid had been broken into by the hanstoria of the *Cuscuta*.

1403 - ***Xanthium ambrosioides*, a New Composite Weed in New South Wales.** — Maiden, J. H. in *The Agricultural Gazette of New South Wales*, Vol. XXIV, Part 9, p. 774. Sydney, September 1913.

This weed, indigenous to Chile, has appeared near Jerilderie. It bears some resemblance to *X. spinosum* (2), but differs from it in its spreading habit, small deeply-divided leaves and grey colour. Every effort has been made to exterminate the weed, but it still threatens to become a serious nuisance. With a view to preventing its reappearance, it is important to determine the source of introduction.

INSECT PESTS.

MEANS OF PREVENTION AND CONTROL

1404 - ***Tetrastichus giffardii* n. sp., a Chalcid Parasitic on Species of *Ceratitis* and *Dacus* in West Africa.** — Silvestri, F. in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXII, Second Half-year, Part 5, pp. 205-206. Rome, September 7, 1913.

The author gives a description of a new species of *Tetrastichus* which he found in Nigeria as a parasite of *Ceratitis stictica* Bèzzi and *C. giffardii*

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(1) In this connection see No. 1298, *B.* Nov. 1913. (*Ed.*).

(2) See No. 2029, *B.* June 1911. (*Ed.*).

Bezzi; later he obtained it also from pupae of *Dacus cucumarius* Sack in the Kamerun, from pupae of *Ceratitis* on the Gold Coast, and again from *C. giffardii* in Dahomey.

This parasite passes its last larval stage and pupates in the pupæ of fruit flies of the genera *Ceratitis* and *Dacus*. He obtained as many as 15 to 34 individual parasites from a single infested pupa.

The parasite deposits its eggs in the eggs of its host, or in the young larvae just hatched, but not in the full-grown larvae and pupae. It is not yet known whether the female lays a single egg which becomes a polyembryo, giving rise to numerous individual parasites in the pupa, or whether it lays several eggs in one host insect.

INSECTS INJURIOUS TO VARIOUS CROPS

1405 - **Injurious Insects in German East Africa.** — MORSTATT, H. in *Der Pflanzer*, Year IX, No 6, pp. 288-296. Daressalam, 1913.

The writer gives a list of 170 injurious insects so far recorded in the colony. After the scientific name of each insect, is given the plant or vegetable product it attacks, also references to publications relating to the insects. The common names of some species or families are given.

1406 - ***Hypsopygia costalis*, Injurious to Lucerne Hay in the Romagna, Italy.** — SBROZZI, DINO in *L'Italia Agricola*, Year IV, No. 18, pp. 444-451, 1 plate. Piacenza, 1913.

Hypsopygia costalis Fab. has been recognised since 1902 as being injurious to sulla hay in Central Italy; it has now begun to attack lucerne hay in the Romagna, where it is known as " tarlo " or " tignola ". The larvae destroy the leaves almost completely, leaving only the stems with a few petioles. Attached to these are numbers of silky threads with cocoons containing pupae, and the excreta and cast-off skins of the larvae. The fodder is thus badly damaged.

In an average attack, or when the hay does not consist entirely of lucerne, the loss is at least 20 per cent, but it may reach 50 or 60 per cent.

The writer explains the life-history of the insect, and mentions that poultry eat the larvae greedily; they may thus be used to destroy them when the hay is shaken out before being fed to stock. Many of the larvae, carried into the stables with the hay during winter, are destroyed by spiders. It is also not uncommon to find larvae and pupae attacked by microscopic parasites not yet identified, and also by Braconids. Carbon bisulphide has not been found effective for disinfecting hay-stacks. The writer recommends that when a stack is attacked it should be used up as soon as possible to prevent the development of the larvae. Hay to be chaffed should first be carefully shaken out so that the larvae falling can be picked up by the poultry. The fodder can be made more acceptable to cattle by moistening with salt water, provided it is not too mouldy. Some larvae, however, will escape and hibernate in the stable. These should be destroyed by carefully cleaning the walls and ceiling, particularly the crevices, towards the end of April, the cocoons swept out being burnt. The stable should then be sprayed with a solution of formaline and white-washed.

The spread of this insect is accounted for by its well known habit of being able to live on any dried refuse. The presence of adults in hawthorn hedges in May suggests that it feeds on the dry leaves of this plant. Thus it can easily attack neighbouring crops of sulla and, owing to its rapid propagation and the favourable hibernating conditions offered by the stacks, it has become a specialised pest of this plant. Once the insect has become adapted to these conditions, it is easy for it to adapt itself to other Leguminosae, such as lucerne.

1407 – **Insects Injurious to Sugar-Cane in British Guiana and their Natural Enemies** (1). — BODKIN, G. E in *The Journal of the Board of Agriculture of British Guiana,* Vol. VII, No. 1, pp. 29-32 Demerara, July 1913.

The writer gives a list of 32 species of injurious insects, most of them well known from other regions, with common names and natural enemies of some.

1408 – **Phricodus hystrix, a Bug attacking Sesame.** — DISTANT, W. L. in *Bulletin of Entomological Research,* Vol. IV, Part 2, p. 143. London, September 1913.

Phricodus hystrix Germar (= *Aradus hystrix* Germ., *Phricodus hystrix* Spin., *Stenotoma desjardinsii* Westw., *Phricodus fasciatus* Sign.) has been found in South and Central Africa, Madagascar and Mauritius. It is now recorded at Coimbatore (Southern India), on sesame (*Sesamum indicum* L.) and is probably a recent introduction there.

1409 — ***Solanophila paenulata*** **("Vaquita de los melones"), Injurious to Cucurbitaceae in the Province of Mendoza (Argentine).** — REED, CARLOS S, in *Agronomia,* Year IV, Vol. II, No. 17-18, pp. 194-197. Buenos Aires, 1913.

This insect, which is found abundantly on melons, lives also on other Cucurbitaceae (pumpkin, watermelon, cucumber, etc.) The larvae are very voracious and cause the appearance in spring of circular spots, 2 cm. in diameter, on the leaves; later the tissues are devoured completely, so that the spots become holes.

The writer describes the life-history of the insect, which appears to have no natural enemies. He observes that it is particularly susceptible to the action of insecticides, and further that it remains exposed on the plants throughout its life-history, being particularly active during the day. It is therefore easy to control.

It frequently happens that these plants are attacked at the same time by aphis and *Solanophila.* The writer recommends spraying in December with an emulsion of ordinary soap and kerosene oil. The 3 per cent. extract of tobacco did not give good results. A mixture of aceto-arsenite of copper (1 gram per litre of water) and 1 gram of lime was found most effective. The spraying should be repeated every 10 or 15 days until the insect disappears. A practical method of control which does not cost much is collecting the larvae in the morning when they are torpid, either by shaking the plants over canvas stretched underneath or by hand-picking.

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(1) See also Nos. 438-440, *B.* Feb. 1912. *(Ed.)*

1410 - ***Eleodes omissa* var. *borealis*, Injurious to Fruit-Trees and Watermelons in California.** — ESSIG, E. O. in *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, p 627, fig. 356. Sacramento, California, August 1913.

During May and June 1913 *Eleodes omissa borealis* (Tenebrionidae) was reported in various districts in California, as causing considerable damage to oranges and watermelons. In one orchard a large number of apricots and plums were completely destroyed by these insects. They appeared in such numbers as almost completely to cover the ground below the infested trees. Poisoned bran was found of little use, since the insect prefers to feed on the plants. Spraying with poisonous solutions gave no better results. It is very probable that the appearance in such large numbers of this insect was due to the abnormally dry season.

1411 - **The Prune Aphis (*Aphis prunifoliae* Fitch) in California.** — ESSIG, E. O. in *The Monthly Bulletin of State Commission of Horticulture*, Vol. II, No. 8, p. 624, fig. 355. Sacramento, California, August 1913.

The appearance of this aphid was recorded in June 1913. Since then the aphid has been recorded from many sections of the Sacramento valley and has caused alarm to some of the prune growers. The louse is light green in colour and is covered with a rather thick coating of fine white powder, which at once distinguishes it from all other lice attacking the prune. It attacks the tips of the twigs and collects in exceedingly large colonies, especially upon the under sides of leaves, which are slightly curled by their work.

In May 1913, the larvae of Syrphid flies and internal Hymenopterous parasites were in sufficient numbers to indicate that the pest would be subdued before it did any great amount of damage. In a few sections, however, control measures were found necessary; these consisted in the application of a spray composed of nicotine sulphate in the proportion of 1 to 1500. A coarse driven spray under high pressure is necessary to force the liquid through the powdery waxy coating secreted by the insect.

1412 - ***Mytilaspis coccomytibus dispar* n. sp. and *Diaspis taxicola* n. sp., Scale Insects observed in Madagascar and Algeria respectively.** — VAYSSIÈRE, P. in *La Revue de Phytopathologie appliquée*, Vol. I, No. 9, p. 124. Paris, October 5, 1913.

Description of two new species. The first was found in large quantities on a branch of *Manihot* from Madagascar, and the second occurred on yew (*Taxus baccata*) in the Atlas of Blida, Algeria.

ALFREDO RUGGERI, *gerente responsabile*.

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

MONTHLY BULLETIN
OF AGRICULTURAL INTELLIGENCE
AND PLANT DISEASES

INDEX

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PREFACE

This index, though arranged alphabetically, retains the grouping of the subjects used in the *Monthly Bulletin.* The arrangement of the subjects in each group is in chronological order of publication, except in the case of those relating to Agricultural Development, where the alphabetical arrangement was considered more useful.

Except in the case of the original articles, which are numbered according to their pages, the numbers of each subject refer to the paragraphs in the *Monthly Bulletin.*

The index consists of three parts: one, of the original articles, one concerned only with Agricultural Intelligence and the last with Plant Diseases.

This volume of contents has been prepared by the redacteurs Dr. Giulio Provenzal and Prof. Giulio Trinchieri.

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